A CAHNERS PUBLICATION

OVERVIEW: Three Markets Shape $243 Billion Industry

DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

THE DATAMATION 100

Featuring:
Financial Data on the Top 100 U.S. Companies
Financial Data on the Top 50 International Companies
Profiles of the World's Top 100 IS Companies
Spotlights on 10 Companies That Make a Difference
Technology Insights by Global Experts

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DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

THE
DATAMATION
100

OVERVIEW

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BY JOSEPH KELLY After a decade of soaring and slumping, the IS industry is cruising nervously into the 1990s. The top 100 Asian, European and North American vendors last year sold $243.1 billion in information technology products and services. But nearly all of the industry's 16.3% growth came from buyers outside the United States.

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Cover Photography by Curt Berner

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BY DATAMATION STAFF AND CONTRIBUTORS The story told in these 100 profiles is a rich one. Revenues from these 100 vendors represent approximately 80% of the entire worldwide IS market. Ten of these companies certainly made a difference to the industry in 1988. Some outgunned everyone else. Others achieved growth via mergers and acquisitions. One even came back from the brink of disaster.

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INSIDE DATAMATION

What the DATAMATION 100 Symbolizes

Symbols powerfully express ideas when they accurately reflect the thought processes behind them. All too often these days, however, symbols are spurs only to wishful thinking: people devise tactics and execute strategies to live up to organizational symbols rather than alter these representations to fit new directions. Fortunately, DATAMATION has resisted the tug of such modern-day hype.

The triangle pictured behind the DATAMATION 100 on the cover and throughout this issue in various forms truly symbolizes the state of affairs in the worldwide information technology industry. The editors didn't arrive at this symbol until after they had thoroughly analyzed the 1988 financial results of the world's leading technology suppliers, whose revenues last year swelled 16.3% to $243.1 billion. Their discovery: the industry, far more than any of us realize, is changing rapidly from a monolithic structure dominated by U.S. vendors and buyers to a multifaceted enterprise where U.S., European and Far Eastern players share nearly equal power. The proof exists not so much in vendor revenues as in customer sales. Although U.S. vendors last year continued to hold more than 60% of the world's IS revenues, U.S. customers accounted for just 38% of all IS sales. Buyers in Europe spend nearly as much on systems as do their North American counterparts, and those in the Pacific Rim aren't far behind.

Photograph by Tom Sobolik/Blackstar

HODGES AND KELLY (r.): distilled the vital statistics.

Photograph by Phillips Photography

TATE AND MURPHY (r.): put 1992 aside and focused on 1988.

Our reporting efforts for the DATAMATION 100 also came from three sides. In the United States, New York Bureau Manager Parker Hodges teamed up with contributing editor Joseph Kelly to extract vital financial information from hundreds of IS companies to see whether they would make the DATAMATION 100 grade, whose entry point this year rose nearly 17% to $350 million. In Europe, international editor Paul Tate, assistant Lauren Murphy and our foreign correspondents hurdled language barriers, negotiated the complexities of international currencies and prevailed over a host of other obstacles in their pursuit of the 22 European companies successful enough to join the DATAMATION 100. And in the Far East, Tokyo-based contributor Stuart Dambrot—aided by Tate in London and section editors Marsha Fisher and Gary McWilliams at the Newton, Mass., headquarters—discovered the ingredients in Japan's mix of growing IS power. Supporting their efforts was a triad of a different sort—a group of copy editors, production editors and art directors, whose efforts you see before you.

Tim Mead

Tim Mead, Editor-in-Chief

DATAMATION

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DATAMATION 100 Markets

($ Billions)		(Share of IS Market*)
30.3	**MAINFRAMES**	12.5
24.1	**MINICOMPUTERS**	10.0
28.4	MICROCOMPUTERS	11.7
16.0	**DATA COMMUNICATIONS**	6.6
61.8	**PERIPHERALS**	25.4
20.8	SOFTWARE	8.6
19.8	SERVICES	8.1
28.8	MAINTENANCE	11.8
13.1	**OTHER**	5.4

Three Markets Shape One Industry

The Top 100 Asian, European and North American vendors last year sold $243.1 billion worth of information technology products and services. The industry's growth came from outside the U.S.

BY JOSEPH KELLY

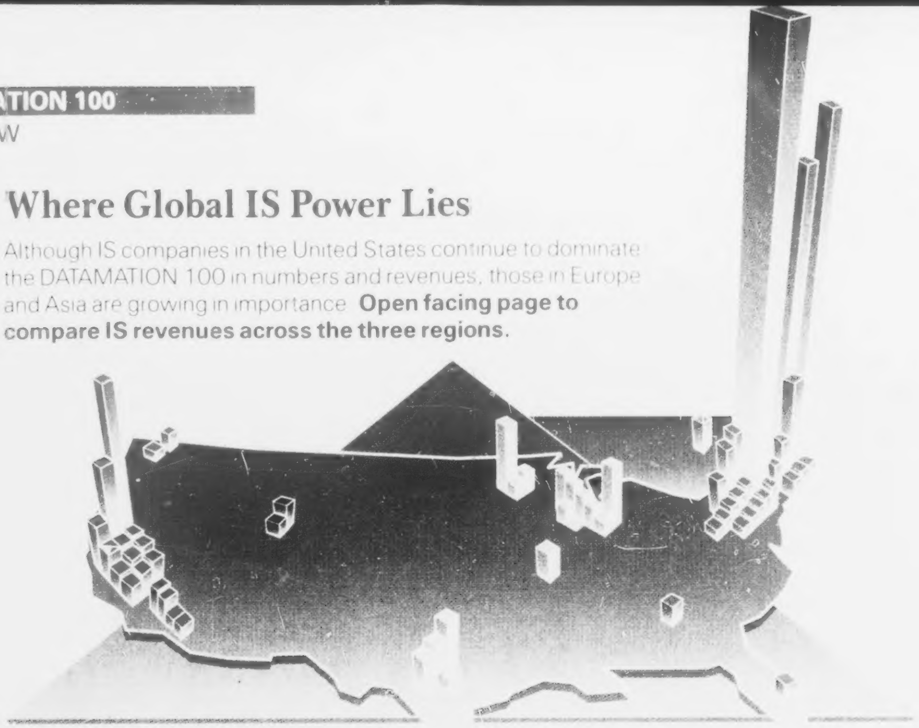
After a decade of soaring and slumping, the IS industry is cruising nervously into the 1990s. The grim words *maturity* and *consolidation* leap to more lips. Go-it-alone IBM is signing partnership agreements with competitors, some so small they'd once have had trouble getting John Akers' phone number, much less his signature on a contract. Dangerous surgery is being performed on R&D budgets. And at a time when vendors are relying on non-U.S. sales to maintain revenue growth, the coming of 1992 and a unified—perhaps protected—European market inspires fear, as well as new market strategies. Still, in 1988, with Japanese and European buyers compensating for weakness in the U.S. market, the world's 100 biggest IS companies were able to post double-digit sales and earnings increases for the second straight year.

What approval this performance merits depends on when you came in and where you came from. Strong sales in 1988's opening quarter allayed fears of a stock-market-crash-induced slowdown, but then things got dicey. While the United States sweltered through a record drought and high temperatures, the IS industry was high and dry as well without enough memory chips. Executives at IS firms scrambled to cope with the sudden shortage of their most precious component and hiked prices. Customers rebelled, and suddenly some high fliers, notably Apple Computer Inc. and Wyse Technology in the United States and Amstrad PLC in the United Kingdom, had to back off.

Turmoil in PCs made the dramatic weakness at the mainframe level all that much more apparent. Add to that a lackluster year for Digital, which has pro-

Where Global IS Power Lies

Although IS companies in the United States continue to dominate the DATAMATION 100 in numbers and revenues, those in Europe and Asia are growing in importance. **Open facing page to compare IS revenues across the three regions.**



61 North American IS Companies

Rank	Company	Location	Total Rev.
	NORTH AMERICA		
	■ CANADA		**$900.0**
56	Northern Telecom	Mississagua, Ont.	900.0
	[illegible]		[illegible]
7	Hewlett-Packard	Palo Alto	6,300.0
12	Apple	Cupertino, Calif.	4,434.1
28	Amdahl	Sunnyvale, Calif.	1,801.8
37	Sun Microsystems	Mountain View, Calif.	1,461.6
38	Tandem Computers	Cupertino, Calif.	1,424.7
40	Seagate Technology	Scotts Valley, Calif.	1,351.0
45	Computer Sciences	El Segundo, Calif.	1,253.4
52	National Semi	Santa Clara	1,018.0
60	Microsoft	Redmond, Wash.	718.6
72	Lockheed	Calabasas, Calif.	620.0
81	Wyse Technology	San Jose	488.7
83	AST Research	Irvine, Calif.	459.0
87	MAI Basic Four	Tustin, Calif.	443.3
90	Oracle	Belmont, Calif.	424.6
91	Science Applications	La Jolla, Calif.	386.0
96	Dataproducts	Woodland Hills, Calif.	364.5
98	Atari	Sunnyvale, Calif.	361.8
99	Micropolis	Chatsworth, Calif.	353.1
	[illegible]		[illegible]
58	Storage Technology	Louisville, Colo.	874.0
74	Miniscribe	Longmont, Colo.	603.3
	■ SOUTHWEST		**$6,342.6**
24	Compaq Computer	Houston	2,065.6
27	EDS	Dallas	1,907.6
29	Tandy Computer	Fort Worth	1,792.4
76	Texas Instruments	Dallas	577.0
	■ MIDWEST		**$18,551.3**
10	NCR	Dayton, Ohio	5,324.0
16	Control Data	Minneapolis	3254.3
26	TRW	Cleveland	1,965.0
39	Zenith	Glenview, Ill.	1,356.0
43	McDonnell Douglas	St. Louis	1,289.0
48	Comdisco	Rosemont, Ill.	1,212.0
49	Arthur Andersen	Chicago	1,198.5
61	Motorola	Schaumberg, Ill.	790.0
64	Cray Research	Minneapolis	756.3

vided much of the industry's excitement in recent years, and suddenly the business was abuzz with talk of another slump—and the near heretical notion that the IS industry is maturing.

The figures compiled by DATAMATION on the IS revenues of the top 100 companies in the business show total sales in 1988 of $243.1 billion, an increase of 16.3%, which is not as good as the 18.7% jump in 1987. Profits rose 15.8%—respectable, but pallid compared with the 27.2% increase posted the previous year. The quarterly performance of 10 U.S.-based IS companies tracked by DATAMATION saw year-to-year revenue growth drop two percentage points between the second and third calendar quarters before leveling off at the end of the year at 11%. (See the "IS Barometer" on page 19.)

The one trend that is clearly up—and decisively so—is the growing international nature of the business. By design or by default (certainly by necessity), the IS industry became more global than ever in 1988, pulled there by market forces, currency fluctuations and the imperative of technology itself.

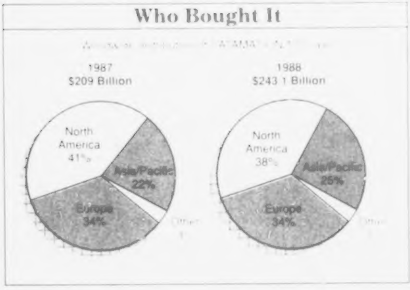
International Sales Up

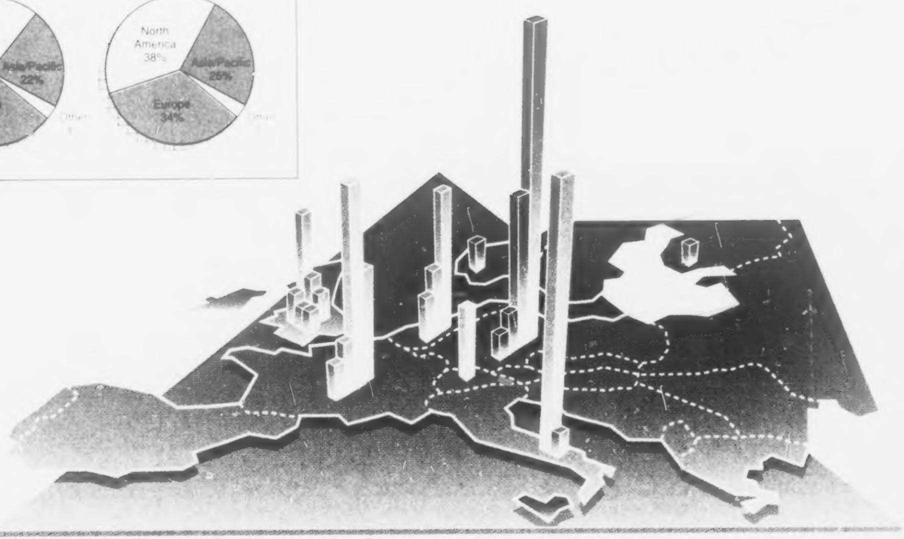
The sales slowdown in the United States together with the cheaper dollar boosted the international business of several U.S.-based IS companies. IBM, for the second year in a row, sold more abroad than it did at home. In fact, the only real sales growth Big Blue experienced came outside the United States. Altogether, 14 U.S. companies on the DATAMATION 100 derived more than half their revenues from outside the United States, including Digital, Hewlett-Packard Co., NCR Corp., Tandem Computers Inc. and Microsoft Corp. COMPAQ Computer Corp. saw its sales rise some 145% in Europe, making it one of the top 25 IS vendors there. Reliance on a weak dollar for export strength is, however, a shaky foundation for long-term planning: the spring 1989 increase in the strength of U.S. currency could weaken the overseas sales of some U.S. vendors.

In Europe, harbingers of 1992's common-market unification have spurred a slew of cross-border alliances. European companies, accustomed to sheltered home markets, must quickly acquire the scale and the management savvy to compete on the newly open European market.

Finland-based Nokia Corp. has been the most active European company to date, acquiring the IS business of LMEricsson Telephone Co. in neighboring Sweden and moving into West Germany to pick up a television manufacturer. Siemens AG, shut out of an important telecommunications deal with Italy's Italtel, salved its wounds by participating in a bid for Britain's Plessey Co. PLC and coming to the United States to take Rolm off IBM's hands. Siemens also initiated a massive reorganization in 1988, as did Olivetti, both with essentially the same stated goal: to flatten the corporate pyramid and make the companies' responses to the marketplace more supple.

Fold out page for worldwide view. ► ► ► ►





22 European IS Companies

Rank Company	Location	Total Rev.
75 3M	St. Paul	588.0
84 Anacomp	Indianapolis	455.4
97 Diebold	Canton, Ohio	362.8
[illegible]		
60 Intergraph	Huntsville, Ala.	800.2
89 Harris	Melbourne, Fla.	425.0
[illegible]		
1 IBM	Armonk, N.Y.	55,002.8
2 Digital Equipment	Maynard, Mass.	12,284.7
5 Unisys	Blue Bell, Pa.	9,100.0
17 Wang	Lowell, Mass.	3,074.4
20 Xerox	Stamford, Conn.	2,650.0
21 AT&T	New York City, N.Y.	2,445.0
33 Auto. Data Processing	Roseland, N.J.	1,617.0
34 Prime	Natick, Mass.	1,594.0
42 Data General	Westborough, Mass.	1,330.5
54 Commodore	West Chester, Pa.	926.1
55 Computer Assoc.	New York City, N.Y.	925.3
65 Martin Marietta	Bethesda, Md.	743.4
67 Continential Info. Sys.	Syracuse, N.Y.	698.4
68 General Electric	Fairfield, Conn.	675.0
70 Bell Atlantic	Philadelphia	657.0
71 Apollo Computer	Chelmsford, Mass.	653.5
80 Emhart	Hartford, Conn.	508.9
82 Lotus	Cambridge, Mass.	468.5
86 American Express	New York City, N.Y.	446.9
88 Nynex	New York City, N.Y.	430.0
93 Shared Medical Sys.	Malvern, Pa.	378.7
100 Eastman Kodak	Rochester, N.Y.	350.0
EUROPE		
■ UNITED KINGDOM		[illegible]
22 STC	London	2,425.1
41 Atlantic Computers	London	1,341.6
59 Amstrad	Essex	841.8
77 Racal Electronics	Berkshire	554.1
95 SD-Scicon	Hampshire	366.4
94 Sema Group	London	375.1
■ THE NETHERLANDS		$5,770.1
19 NV Philips	Eindhoven	2,794.6
23 Memorex Telex	Amsterdam	2,078.5
57 Econocom	Amsterdam	897.0

In the United Kingdom, STC PLC, in which Northern Telecom Ltd. owns a 24% equity, bought Northern's European data terminal business, then crossed the Atlantic to snatch up the minicomputer maker Computer Consoles Inc. and the Datachecker operation of National Semiconductor Corp. The merger of Systems Designers and Scicon International in the United Kingdom created Europe's second-largest software and services house after France's Cap Gemini Sogeti, with the newly expanded Sema Group taking the third position, thanks to the merger between Sema-Metra of France and Cap Group PLC in the United Kingdom. Finsiel SpA, the Italian software and services company, and Europe Computer Systems, the leasing firm owned by the French Bank Société Générale, also grew outside their home countries, with Finsiel testing the waters in the United States.

The dangers of a vendor relying too heavily on its home market were clearly in evidence at Norsk Data AS, which reported a $41.6 million pretax loss in 1988 after losing key strategic orders to the likes of Apple, Digital, IBM and Groupe Bull. Both Norsk Data AS and Comparex Informationssysteme GmbH are leading examples of European companies that analysts believe must wean themselves from overdependence on their home bases.

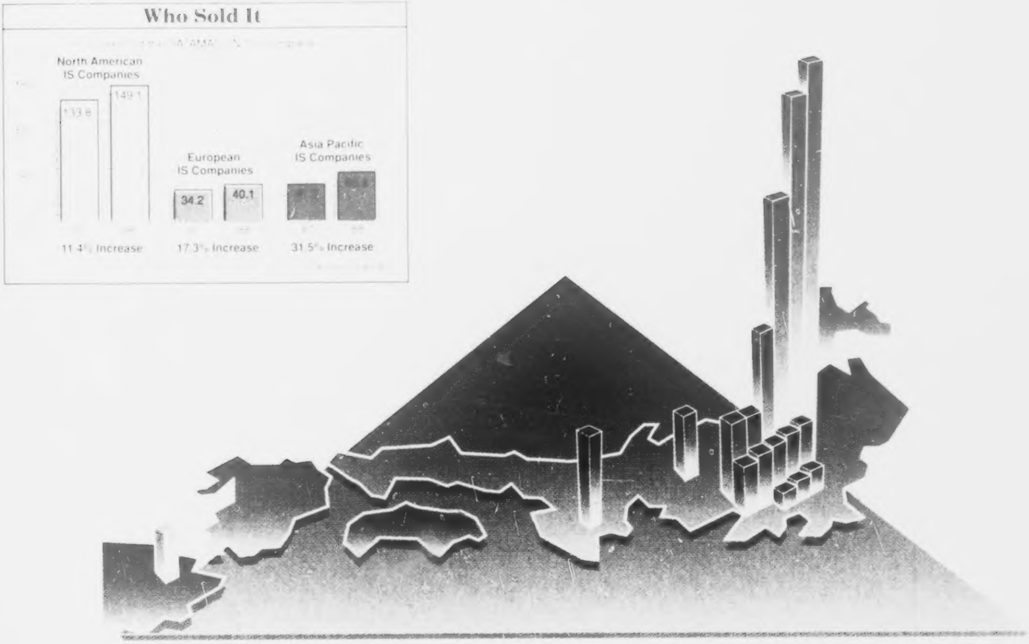
Japanese Eye Global Markets

Japanese companies are also positioning themselves in newly opening global markets. Since the mid-1980s they have been assiduously shifting manufacturing operations closer to their export markets, a trend that continued in 1988. Urgency was added by the strength of the yen and fears of potential trade restrictions in both Europe and the United States. Alps Electric Co. Ltd. announced it was building a manufacturing plant in West Germany and also expanding its operations in the United States. Both Seiko Epson Corp. and Fujitsu Ltd. announced new plants in the United Kingdom while Mitsubishi Electric Corp. announced it would establish a subsidiary with manufacturing facilities in France.

The geographic distribution of companies on the DATAMATION 100 was exactly the same as it was in 1987: 61 North American companies, 22 from Europe and 17 from Japan and the Far East. (Acer Group from Taiwan replaced Samsung Group from South Korea).

The makeup of the top 10 is also the same as last year, the year before that and (taking into account the Unisys merger) the year before that: Five U.S. companies (IBM, Digital, Unisys Corp., Hewlett-Packard and NCR); three Japanese companies (Fujitsu, NEC Corp. and Hitachi Ltd.) and two European companies (Siemens and Olivetti).

These 10 companies—with Groupe Bull waiting in the wings—make up the new global IS junta. Collectively, these ten companies controlled more than half of the total IS market in 1988, with IBM alone accounting for 22.6%. They are to the



17 Far Eastern IS Companies

Rank	Company	Location	Total Rev.
FRANCE			**$9,211.8**
11	Groupe Bull	Paris	5,296.7
31	Alcatel	Paris	1,716.0
47	Societe Generale	Paris	1,222.6
53	Cap Gemini Sogeti	Paris	976.5
[illegible]			
8	Siemens	Munich	5,951.0
18	Nixdorf	Paderborn	3,044.9
63	Mannesmann Kienzle	Dussledorf	779.0
73	Comparex IS	Mannheim	614.5
SWITZERLAND			**$1,230.3**
45	Inspectorate Int'l	Neuchâtel	1,230.3
[illegible]			
48	Nokia	Helsinki, Finland	1,165.1
85	Norsk Data	Oslo, Norway	450.2
ITALY			**$5,973.3**
9	Olivetti	Ivrea	5,427.9
78	Finsiel	Rome	545.4
THE FAR EAST			
[illegible]			
3	Fujitsu	Tokyo	10,999.1
4	NEC	Tokyo	10,475.7
6	Hitachi	Tokyo	8,247.6
13	Toshiba	Tokyo	4,226.6
14	Matsushita	Osaka	3,441.0
15	Canon	Tokyo	3,391.6
25	Nihon Unisys	Tokyo	2,057.7
30	Ricoh	Tokyo	1,727.5
32	NTT	Tokyo	1,694.0
35	Seiko Epson	Nagano	1,487.7
36	Oki	Tokyo	1,472.1
44	Mitsubishi	Tokyo	1,270.7
51	C. Itoh	Tokyo	1,075.9
62	Alps	Tokyo	785.2
69	CSK Group	Tokyo	660.0
79	Sony	Tokyo	515.6
TAIWAN			**$379.4**
92	Acer Group	Taipei	379.4

global IS market of the 1980s what IBM and the BUNCH were to the United States in the 1970s. The rise of these global IS giants has generated fears of potentially destructive trade wars. For several years, trade friction has been a staple of U.S.-Japanese relations, and both of those superpowers are watching warily to detect any inkling of "Fortress Europe" in the preparations for 1992.

Growing Global Cooperation

But focusing on the trade-war aspect of global competition may disguise another, potentially more significant trend: the growing level of global cooperation among today's largest multinational companies. According to this scenario, what the big companies really fear is not each other, but the small upstart companies in their home markets—companies that develop innovative products and grab precious market share. According to Kenichi Ohmae of McKinsey & Co., whose book *Triad Power*, published by the Free Press in 1985, describes the new style of global competition between European, Japanese and U.S. multinationals, "There is clear indication today that the top management of global enterprises are seriously interested in protecting home market positions and, if necessary, are willing to cooperate with other Triad-region competitors rather than fight them off in destructive trade wars."

Slackening demand in the United States makes an increased international focus necessary for North American IS firms. Mergers, the downsizing of corporate America, the ability to buy more computer power for less money, the continuous sniping over standards—all of these much-discussed trends have contributed to reduced growth in the U.S. market. In 1988, sales by DATAMATION 100 companies into the U.S. market grew by only 8.4%, compared with 14.5% for Europe and 29% in Asia/Pacific, including Japan. In 1988, the North American share of overall DATAMATION 100 sales slipped to 38.4% from 1987's 40.8% with almost all of that difference accounted for by the growth in Japanese demand for IS.

The decline in the popularity of big systems bears much of the blame for the contraction in the U.S. market. IBM, Control Data Corp., NCR and Unisys all posted mainframe sales that ranged from mediocre to just plain bad. In sharp contrast, the leading Japanese mainframe makers posted revenue growth in their own currency of as much as 20%. In the United States, only Amdahl Corp. could report comparable results, its processor sales rising 32.3%. Overall, the big machine's role in the IS market continued to drift downward, accounting for only 12.5% of sales last year.

Unhealthy Minis

Minicomputer sales—even including workstations—were far less healthy than anyone would have expected. In the United States, Digital was definitely off its feed, while Wang Laborato-

The DATAMATION 100 - The Leading Worldwide IS Companies

NORTH AMERICA
$14[illegible] BILLION

EUROPE
$4[illegible] BILLION

ASIA/PACIFIC
$5[illegible] BILLION

1988 Rank	COMPANY	1988 IS REVENUE	1988 Rank	COMPANY	1988 IS REVENUE
1	IBM	$55,002.8	51	C. Itoh	1,075.9
2	Digital Equipment	12,284.7	52	National Semiconductor	1,018.0
3	Fujitsu	10,999.1	53	Cap Gemini Sogeti	976.5
4	NEC	10,475.7	54	Commodore	926.1
5	Unisys	9,100.0	55	Computer Associates	925.3
6	Hitachi	8,247.6	56	Northern Telecom	900.0
7	Hewlett-Packard	6,300.0	57	Econocom	897.0
8	Siemens	5,951.0	58	Storage Technology	874.0
9	Olivetti	5,427.9	59	Amstrad	841.8
10	NCR	5,324.0	60	Intergraph	800.2
11	Groupe Bull	5,296.7	61	Motorola	790.0
12	Apple	4,434.1	62	Alps	785.2
13	Toshiba	4,226.6	63	Mannesmann Kienzle	779.0
14	Matsushita	3,441.0	64	Cray Research	756.3
15	Canon	3,391.6	65	Martin Marietta	743.4
16	Control Data	3,254.3	66	Microsoft	718.6
17	Wang	3,074.4	67	Continental Information Systems	698.4
18	Nixdorf	3,044.9	68	General Electric	675.0
19	NV Philips	2,794.6	69	CSK	660.0
20	Xerox	2,650.0	70	Bell Atlantic	657.0
21	AT&T	2,445.0	71	Apollo Computer	653.5
22	STC	2,425.1	72	Lockheed	620.0
23	Memorex Telex	2,078.5	73	Comparex	614.5
24	Compaq	2,065.6	74	Miniscribe	603.3
25	Nihon Unisys	2,057.7	75	3M	588.0
26	TRW	1,965.0	76	Texas Instruments	577.0
27	Electronic Data Systems	1,907.6	77	Racal Electronics	554.1
28	Amdahl	1,801.8	78	Finsiel	545.4
29	Tandy	1,792.4	79	Sony	515.6
30	Ricoh	1,727.5	80	Emhart	508.9
31	Alcatel	1,716.0	81	Wyse Technology	488.7
32	NTT	1,694.0	82	Lotus	468.5
33	Automatic Data Processing	1,617.0	83	AST Research	459.0
34	Prime	1,594.0	84	Anacomp	455.4
35	Seiko Epson	1,487.7	85	Norsk Data	450.2
36	Oki	1,472.1	86	American Express	446.9
37	Sun Microsystems	1,461.6	87	MAI Basic Four	443.3
38	Tandem Computers	1,424.7	88	Nynex	430.0
39	Zenith	1,356.0	89	Harris	425.0
40	Seagate Technology	1,351.0	90	Oracle	424.6
41	Atlantic Computers	1,341.6	91	Science Applications	386.0
42	Data General	1,330.5	92	Acer Group	379.4
43	McDonnell Douglas	1,289.0	93	Shared Medical Systems	378.7
44	Mitsubishi	1,270.7	94	Sema Group	375.1
45	Computer Sciences	1,253.4	95	SD-Scicon	366.4
46	Inspectorate International	1,230.3	96	Dataproducts	364.5
47	Société Générale	1,222.6	97	Diebold	362.8
48	Comdisco	1,212.0	98	Atari	361.8
49	Arthur Andersen	1,198.5	99	Micropolis	353.1
50	Nokia	1,165.1	100	Eastman Kodak	350.0

Revenue figures are in millions of dollars.

ries Inc. and Data General Corp. were positively anemic. The big European minicomputer makers, Nokia (which acquired Ericsson's ailing IS business) and Norsk Data, both had poor years. Overall, worldwide minicomputer sales rose just 8% and account for an even 10% of the overall IS market. The area in minicomputers that bears continued watching is on-line transaction processing (OLTP) which, according to Dataquest Inc., a market research firm in San Jose, Calif., now accounts for one out of every two system sales.

Sluggish performance in the mainframe and minicomputer segments was part of the evidence cited by those who believe that IS is maturing. But for some segments of the industry, such as software, maturation actually means growth, and 1988 provided a hint of the kind of growth the industry can expect to see in the future.

Software sales rose 22.3% last year to $20.8 billion. The stellar performer here was Oracle Corp., the mainframe software company that is appearing on the DATAMATION 100 for the first time. Oracle's 114.4% growth rate was tops among companies that did not grow by acquisition—the first time a software company has achieved that distinction since Lotus Development Corp. did it in 1984.

Oracle provides a telling insight in to the future of the IS business because, as Michael Braude points out in his analysis of the software business on page 160, it successfully exploits the very things—standards, open architectures, downsizing—that bedevil established IS competitors. And Oracle seems to understand the kind of marketing clout that's needed to get its story across to customers.

The revenues of the computer services companies on the DATAMATION 100 grew a healthy 23.1% in 1988 thanks to new entrants and the growth of systems integration. Electronic Data Systems Corp. proved there is life after H. Ross Perot, posting a 32.4% sales increase and emerging as the number 1 company in services. In Europe, acquisitions and mergers fueled the rise of Cap Gemini, SD-Scicon and Sema Group, the latter two appearing on the DATAMATION 100 for the first time. Other newcomers in the services sector included American Express, which has just started to release information about its various information services subsidiaries, primarily in credit card processing; NYNEX Corp., the Bell operating company that acquired AGS Computers Inc. and became a full-fledged player in systems integration; and Science Applications International Corp., the employee-owned firm that has traditionally specialized in national security work, but which is now turning its attention to commercial systems integration and commercial software development.

Hearty Workers

IS companies with the highest revenue per employee

	DTM 100 RANK	COMPANY*	REVS. PER EMPL. ($ THOU.)	1988 IS REVS. ($MIL.)	1988 EMPLS.
1	41	**Atlantic Computers**	937.5	1,341.6	1,431
2	57	**Econocom Int'l**	607.0	971.2	1,600
3	73	**Comparex**	545.3	614.5	1,127
4	12	**Apple**	409.2	4,434.1	10,836
5	24	**Compaq**	344.3	2,065.6	6,000
6	54	**Commodore**	274.0	926.1	3,380
7	25	**Nihon Unisys**	270.2	2,057.7	7,616
8	83	**AST Research**	226.7	459.0	2,025
9	28	**Amdahl**	217.1	1,801.8	8,300
10	66	**Microsoft**	205.3	718.6	3,500
11	82	**Lotus**	182.8	468.5	2,563
12	37	**Sun Microsystems**	177.1	1,461.6	8,253
13	38	**Tandem Computers**	162.9	1,424.7	8,745
14	81	**Wyse Technology**	152.7	488.7	3,200
15	71	**Apollo Computer**	147.0	653.5	4,446

Leasing companies—Atlantic and Econocom—get the most from the least, but it's PC and workstation companies that dominate the list.

*Includes only companies with at least 95% of revenues from IS.

Growth Spurts

The companies that grew the most in 1988

	DTM RANK	COMPANY	IS REV. IN LOCAL CURRENCY (MIL.) 1988	1987	% INCREASE
1	50	**Nokia***	Fmk4,877.0	Fmk1,835.0	165.78
2	88	**Nynex***	$430.0	$180.0	138.89
3	90	**Oracle***	$424.6	$198.0	114.44
4	37	**Sun Microsystems**	$1,461.6	$755.9	93.36
5	94	**Sema***	£210.8	£120.6	74.79
6	67	**Continental Info.***	$698.4	$405.4	72.27
7	24	**Compaq**	$2,065.6	$1,224.1	68.74
8	74	**Miniscribe**	$603.3	$362.5	66.43
9	34	**Prime Computer***	$1,594.0	$960.9	65.89
10	49	**Arthur Andersen**	$1,198.5	$748.9	60.03
11	83	**AST Research**	$459.0	$289.8	58.39
12	66	**Microsoft**	$718.6	$456.7	57.35
13	12	**Apple**	$4,434.1	$3,041.2	45.80
14	98	**Atari**	$361.8	$250.0	44.72
15	55	**Computer Assoc.***	$925.3	$648.8	42.62

Acquisitions by Nokia (Ericsson's IS business) and Nynex (AGS Computers Inc.) propelled those companies to new heights. Even without its small acquisition, Oracle outpaced Sun as the company that grew the most internally.

*Denotes a company where a merger or acquisition occurred.

Despite staff defections, Arthur Andersen & Co. posted a 60% gain in worldwide revenues from systems integration and software reaching just under $1.2 billion. Among all the Big Eight firms, Arthur Andersen has the largest data services group, but it now has a new and potentially formidable competitor in the newly merged Arthur Young and Ernst & Whinney, which had combined systems integration revenues in 1988 of just under a half billion dollars. In Japan, CSK Corp. became the first big Japanese company to focus on systems integration.

Strength in Micros

But microcomputers continue to attract the most attention. Despite the memory chip shortage, worldwide sales rose a remarkable 26.8% and now account for 11.7% of overall IS sales, very nearly rivaling sales of mainframes. Compaq, Apple, Toshiba Corp. and Zenith Electronics Corp. all posted strong performances in 1988. In the United States, according to Dataquest, Apple actually surpassed IBM in PC unit market share, reflecting the lukewarm acceptance accorded the PS/2 and the premature withdrawal of the AT. Two new U.S.-based PC companies to make the DATAMATION 100 in 1988 were Atari Corp. (which does 85% of its sales in Europe) and AST Research Inc. According to Dataquest, Korean and Taiwanese companies will begin to come on strong. Acer, the largest such company to date, made the DATAMATION 100 for the first time in 1988, reporting PC sales of just under $300 million.

Top Performers

IS companies with the highest return on sales

	DTM 100 RANK	COMPANY*	1988 % RETURN ON SALES	1987 % RETURN ON SALES
1	66	**Microsoft**	21.1	20.4
2	64	**Cray Research**	20.7	21.4
3	55	**Computer Associates**	15.4	9.3
4	59	**Amstrad**	14.9	17.9
5	90	**Oracle**	14.6	15.0
6	82	**Lotus**	12.6	18.2
7†	28	**Amdahl**	12.4	9.7
8†	24	**Compaq**	12.4	11.1
9†	33	**Automatic Data Processing**	11.0	10.2
10†	60	**Intergraph**	11.0	10.9
11	2	**Digital Equipment**	9.8	12.4
12	1	**IBM**	9.7	9.5
13	12	**Apple**	9.5	9.2
14	7	**Hewlett-Packard**	8.3	8.0
15	97	**Diebold**	7.9	8.1

Top honors went to Microsoft and Cray for the third year in a row, while Amstrad, Lotus and DEC slipped from their 1987 pace.

*Includes only DTM 100 companies whose primary business is from IS (more than 75% of revenues).

†Before rounding, the 1988 % for return on sales was 12.39 at Amdahl, 12.35 at Compaq and 11.02 at Automatic Data Processing Inc.

The $61.8 billion market for peripherals was the scene of upheaval among disk-drive makers with the transition to 3½-inch drives. Micropolis Corp. earned the distinction of debuting on the DATAMATION 100 while, in the same year reporting a net loss. Two other newcomers to the DATAMATION 100 were in the magnetic media area: Eastman Kodak Co., owner of Verbatim Corp. returned to the DATAMATION 100 after a one-year absence; Anacomp Inc., better known for its computer-output microfilm business, appears on the list having bought (and now having put up for sale) the magnetic media part of Xidex Corp.'s business.

Sales of data communications equipment, including communications processors, PBXs, modems, multiplexors and the like rose only 6.7% to $16 billion in 1988. Price competition in all aspects of data communications and the continual evolution of standards kept this market in check. AT&T took a $6.7 billion charge for digitizing its network—a process the company hopes to have substantially completed by 1992. Northern Telecom also took a $200 million write-down for restructuring costs and announced a big push into Europe and Asia in an effort to overcome flat sales revenue in the tight North American market.

Maintenance revenues, an increasingly important source of income for IS companies, were essentially flat in 1988 at just under $30 billion. That figure reflects the effects of price wars unleashed by IBM. Revenues of companies in the DATAMATION 100's "other" category, which consists primarily of independent computer leasing firms in the United States and Europe, were also flat, reflecting the extremely tight conditions in that market.

Companies that dropped off the DATAMATION 100 in 1988 include Datapoint Corp., the one-time minicomputer and local area network pioneer; Tandon Corp., which has shifted from disk drives to PC clones; Tektronix Inc., slumping because of ailing terminal business; and Gould Inc., acquired in 1988 by Nippon Mining Co. Ltd. (In March, 1989, Nippon Mining sold Gould's IS business to Encore Computer Corp.)

Ten companies on the DATAMATION 100 lost money in 1988. Two minicomputer companies, Data General and Norsk Data, both suffered because of their closed architectures and Norsk's overreliance on its home market. Two disk drive makers, Micropolis and Seagate Technology, misjudged the rapid shifts in that market. Wyse was done in by the memory chip shortage and Dataproducts by the shift to laser printers. Continental Information Systems tried to grow too fast, too soon in the highly competitive leasing market, ending up in Chapter 11 bankruptcy proceedings. AT&T's massive write-off for upgrading its long-distance network devoured its profits, while Atari's loss stemmed from the write-off of its disastrous foray into computer retailing.

The swelling concern over junk-bond mergers—one of the biggest business stories of 1988—was not a big factor in IS. In the United States, big acquisitions were in computer-aided design and manufacturing (CAD/CAM) with Prime Computer Inc.'s purchase of both Computervision Corp. and part of General Electric's Calma Co. business. Another large IS acquisition was Computer Associates International Inc.'s purchase of Applied Data Research Inc. from Ameritech Corp. Hewlett-Packard's purchase of Apollo Computer Inc. gives HP first place in the evolving workstation market. In Europe, the biggest deal was Nokia's purchase of Ericsson's undernourished IS operations.

Missing Links

Among the most interesting linkups were those that didn't happen: NCR was said to be a target, first of Unisys and then of AT&T. Apple and Cray Research Inc. were proposed by some as an ideal match, as were Wang and Xerox Corp. The takeover threat prompted Xerox to restructure and refocus its marketing, particularly of its publishing systems; takeover talk was also an impetus behind Lockheed Corp.'s decision to put its IS businesses on the block. To come, of course, is the denouement of the long-running MAI Basic Four Inc. attack on Prime.

While merger mania did not take hold in IS, critics view a slackening commitment to R&D as emblematic of the same short-term, get rich quick outlook. Although R&D spending rose overall by

Big Returns

The companies with the highest return on assets

	DTM 100 RANK	COMPANY*	1988 % RETURN ON ASSETS	1987 % RETURN ON ASSETS
1	41	**Atlantic Computers**	31.3	52.7
2	59	**Amstrad**	30.4	46.6
3	66	**Microsoft**	25.0	32.3
4	91	**Science Applications**	24.0	8.4
5	90	**Oracle**	18.5	16.0
6	12	**Apple**	18.4	17.3
7	24	**Compaq**	16.1	15.1
8	64	**Cray Research**	15.8	16.3
9	82	**Lotus**	14.0	22.7
10	55	**Computer Associates**	12.3	7.7
11	2	**Digital Equipment**	11.8	13.6
12	78	**Finsiel**	11.7	15.6
13	28	**Amdahl**	11.6	9.7
14	27	**Electronic Data Systems**	11.2	10.9
15†	33	**Automatic Data Processing**	11.2	9.4

Leasing, software and services companies dominate this list. Both Microsoft and Lotus were down significantly from 1987.

*Includes only DTM 100 companies whose primary business is from IS (more than 75% of revenues).

†Before rounding, ROA at Electronic Data Systems was 11.24 and Automatic Data Processing was 11.19.

nearly 15%, the typical R&D commitment by U.S. DATAMATION 100 firms dropped a full percentage point from 10.9% of total revenue to 9.9%. This shrinking commitment to R&D comes at a time when Japanese firms are redeploying their R&D activities on a global basis. NEC opened its NEC Research Institute in Princeton, N.J., in 1988, and Epson, Hitachi and Canon Inc. have all indicated plans to establish R&D centers in the United States and Europe. Among U.S. IS companies, only IBM has a significant R&D presence worldwide, but there are signs that situation may be changing. Recent studies by the National Science Foundation show that R&D spending by U.S. companies is increasing more abroad than it is at home.

At the beginning of the 1980s, when the United States was both the biggest and the fastest-growing IS market, a U.S. strategy was a global strategy. But that's not the case now. The world simply doesn't work that way any more.

Methodology

Throughout the year, DATAMATION collects information on more than 200 companies on a worldwide basis. The companies are then ranked on the basis of their IS revenues for the calendar year. All revenue and earnings figures in the current DATAMA-

In the Red

Ten that lost money

	DTM 100 RANK	COMPANY	1988 EARNINGS LOSS ($ MIL.)
1	21	AT&T	1,669.0
2	98	Atari	84.8
3	42	Data General	48.9
4	85	Norsk Data	41.6
5	99	Micropolis	19.4
6	52	National Semiconductor	18.1
7	96	Dataproducts	11.3
8	67	Continental Info. Sys.	10.8
9	81	Wyse Technology	6.9
10	40	Seagate Technology	5.5

Write-offs sent AT&T and Atari into the red. Data General repeats for the third time and Data Products for the second. Continental is in Chapter 11 bankruptcy proceedings.

Shakeout in the Computer Industry?

BY KENNETH FLAMM

The computer industry's recent slowdown has inspired some observers to predict a major consolidation and restructuring in the industry. According to the basic logic behind this prediction, the era of extraordinarily high growth rates is coming to an end and, with the onset of maturity, the industry must realign itself into a much smaller number of bigger, leaner and meaner companies. According to this view, the slowdown signals a much broader and profound shakeout to come. I do not believe this to be the case; in my view, there are four mitigating points to consider.

First of all, the computer industry has always coasted up and down with the business cycle. Currently, businesses are holding back on capital investment amidst widespread uncertainty over whether a recession may occur in the latter part of this year. But the current slump is no worse than those seen in the past and is arguably less severe. In the 1981 downturn, for example, U.S. computer equipment sales grew only 2.3% after inflation. Typically, foreign markets cushion the impact of a domestic downturn. For example, in 1981 direct imports rose to 28% of total U.S. shipments compared with 26% in 1979 and 1982.

Second, in 1988 extraordinary increases in the price for dynamic random access memory (DRAM) chips—courtesy of Japan's Ministry of International Trade and Industry, the U.S. Department of Commerce and a confused U.S. trade policy—resulted in system prices that were flat or even rose somewhat. Those flat prices were a sharp contrast to the normal 20%-plus annual decline in quality-adjusted system cost. Since computer demand is quite price sensitive (economists suggest a price elasticity of 1.5—i.e., that a 10% increase in price causes a 15% decline in demand), this clearly put a considerable damper on computer demand. Accustomed to yearly sales increases of 20 to 30%, many companies did not correctly predict the impact of flat pricing on their sales.

Third, the computer industry is going through a period of great uncertainty. Nonproprietary international standards like UNIX have now become firmly established and may soon become the major force in the industry's continued evolution. At the time, however, uncertainties about standards are a giant headache for consumers. UNIX or OS/2, MicroChannel or EISA—these are just a few of the choices that a high-end PC consumer must consider. Not a few users are postponing their purchases and letting someone else make the mistakes until the market's direction is clearer. All of these new systems, incidentally, are much more memory intensive than older technology, and the increase in DRAM prices motivated some users to defer purchasing new systems.

Finally, the fundamental factor driving the double-digit growth of the computer industry has been the continuing steep decline in the cost of computing capacity. This radical decline in price has created new demands for computing in new applications. There is no obvious reason—our misguided trade policy notwithstanding—why the decline in memory and processor cost that has propelled computer prices downward should not continue indefinitely. This would create new markets and new opportunities for small start-ups to earn their spurs by creating innovative products. Indeed, the growing role of nonproprietary industry standards suggests that it should become easier to enter the market and that the computer industry should grow more competitive, not less. Today, you don't need to produce an entire system to become a player, you merely need to build one small piece of it better than anyone else. Nonproprietary standards guarantee a ready market out there for a better mousetrap—one that others can integrate into their systems.

Kenneth Flamm, an economist specializing in high-technology industries, is a senior fellow at The Brookings Institution, Washington, D.C. He is the author of Creating the Computer: Government, Industry and High Technology *(Brookings, 1988); and* Targeting the Computer: Government Support and International Competition *(Brookings, 1987).*

TION 100 are for calendar year 1988. Because many companies operate on a fiscal year that does not coincide with the calendar year, some data, such as expenditures on research and development, are reported as of the company's most recent fiscal year-end.

For the purposes of the DATAMATION 100 survey, data-processing revenues are defined as being derived from sales of the following: computer systems, including mainframes, minicomputers, microcomputers, personal computers, workstations, word processors, office systems and CAD/CAM systems; peripherals, including terminals, printers, plotters, disk drives, tape drives, magnetic media and data entry devices; software, including operating systems and applications programs; data communications equipment, including communications processors, local area networks, digital PBXs, multiplexors, modems and facsimile machines; data services, including custom programming, systems integration, consulting, time-sharing and remote processing; maintenance and repair; computer leasing; point-of-sale systems; and automatic teller machines.

Explicitly excluded are the following: data transmission or "basic" services from specialized common carriers that are not integrated with a data-processing service; stand-alone electronic or mag card typewriters; stand-alone electronic cash registers; instrumentation; semiconductors; printed circuit boards; automatic test equipment; DP supplies, with the exception of magnetic media for disk and tape drives; industrial control devices; central office telephone switches; analog PBXs; and computer-output-micrographic systems.

Figures listed in the DATAMATION 100 for mainframes and minicomputers represent only the sale of the processor itself; figures for peripherals and software that are sold as part of a system are grouped into the peripherals and software categories.

Whenever possible, information in the DATAMATION 100 is obtained from the companies themselves. When a company will not provide information, or will not provide it in a form suitable for this survey, we have estimated the figures based on investiga-

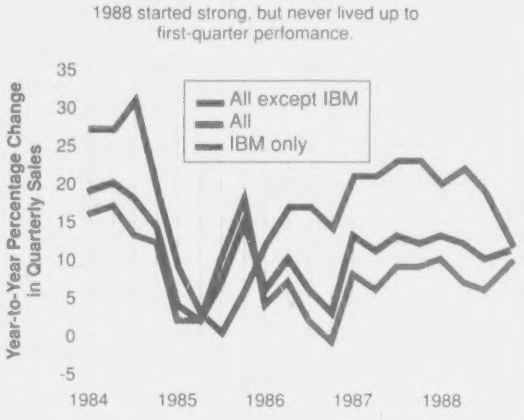
Falling Fortunes

Ten companies that couldn't keep up in IS

	DTM 100 RANK	COMPANY	IS REV. IN LOCAL CURRENCY (MIL.) 1988	1987	% DECREASE
1	31	Alcatel	ECU1,450.0	ECU1,780.0	18.54
2	109	Tandon	$309.3	$374.0	17.30
3	68	General Electric	$675.0	$750.0	10.0
4	118	Gould	$275.0	$299.3	8.12
5	77	Racal Electronics	£311.4	£335.8	7.27
6	89	Harris	$425.0	$446.0	4.71
7	93	Shared Medical	$378.7	$390.7	3.07
8	46	Inspectorate Int'l	SFr1,800.0	SFr1,835.3	1.92
9	84	Anacomp	$455.4	$455.7	0.07

MIS Operations – 7:06 PM

IS Barometer: How 10 Leading Companies IS Sales Are Faring*



*Based on ten leading companies with revenues predominantly from IS: Amdahl, Apple, Commodore, Data General, Digital Equipment, IBM, NCR, Prime, Tandem, Wang.

tive reporting and an analysis of industry trends.

The net income reported for each company represents total earnings, not just earnings from data-processing revenues. Revenues derived from sales to other divisions or units within a company are considered captive sales and are not included in this survey.

Results for non-U.S. companies are converted into dollars using the Organization of Economic Cooperation and Development (OECD) average exchange rates. For those currencies not part of the OECD, exchange rate information was provided by the International Monetary Fund.

For 1988, equivalents to one dollar in these currencies were the following: European Currency Unit, ECU0.8450; Finland, Fmk4.1860; France, Fr5.9560; Italy, L1301.6820; Japan, ¥128.1500; the Netherlands, G1.9770; Norway, NKr6.5170; Sweden, SKr6.1290; Switzerland, SFr1.4630; Taiwan, TD28.636; the United Kingdom £0.5620; West Germany, DM1.7560; South Korea, W731.4700.

For 1987, equivalents to one dollar in these currencies were the following: European Currency Unit, ECU0.87; Finland, Fmk4.40; France, Fr6.01; Italy, L1296.97; Japan, ¥144.62; the Netherlands, G2.03; Norway, NKr6.74; Sweden, SKr6.34; Switzerland, SFr1.50; Taiwan, D31.76; the United Kingdom, £0.61; West Germany, DM1.80; South Korea, W822.57.

DATAMATION would like to thank the following for providing information used in the DATAMATION 100: Daratech Inc., Cambridge, Mass; Dataquest Inc., San Jose, Calif.; First Boston Corp., New York City; Future Computing Inc., Richardson, Texas; International Technology Group, Los Altos, Calif; Merrill Lynch, New York City; Northern Business Information, New York City; Sanford C. Bernstein & Co., New York City; Santa Clara Consulting Group, Santa Clara. Calif; Smith Barney, Harris Upham & Co., New York City. ▭

Situation: Critical

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The 100 Leading U.S. IS Companies

1988 US RANK	1988 WORLD RANK	1987 WORLD RANK	COMPANY	1988 IS REVENUE	1987 IS REVENUE	IS REV % CHANGE	1988 TOTAL REVENUE	IS AS % OF TOTAL REVENUE
1	1	1	IBM	55,002.8	50,614.0	8.7	59,681.0	92.2
2	2	2	Digital Equipment	12,284.7	10,391.3	18.2	12,284.7	100.0
3	5	3	Unisys	9,100.0	8,900.0	2.3	9,902.0	91.9
4	7	9	Hewlett-Packard	6,300.0	5,000.0	26.0	9,831.0	64.1
5	10	8	NCR	5,324.0	5,087.0	4.7	5,989.9	88.9
6	12	14	Apple	4,434.1	3,041.2	45.8	4,434.1	100.0
7	16	15	Control Data	3,254.3	2,975.9	9.4	3,628.3	89.7
8	17	13	Wang	3,074.4	3,045.7	0.9	3,074.4	100.0
9	20	19	Xerox	2,650.0	2,415.0	9.7	16,441.0	16.1
10	21	24	AT&T	2,445.0	2,000.0	22.3	35,210.0	6.9
11	23	36	Compaq	2,065.6	1,224.1	68.7	2,065.6	100.0
12	25	25	TRW	1,965.0	1,960.0	0.3	6,982.1	28.1
13	26	30	Electronic Data Systems	1,907.6	1,440.5	32.4	4,844.1	100.0
14	27	28	Amdahl	1,801.8	1,505.2	19.7	1,801.8	100.0
15	28	26	Tandy	1,792.4	1,692.4	5.9	3,992.3	44.9
16	32	29	Automatic Data Processing	1,617.0	1,467.0	10.2	1,617.0	100.0
17	33	50	Prime	1,594.0	960.9	65.9	1,594.0	100.0
18	36	55	Sun Microsystems	1,461.6	755.9	93.4	1,461.6	100.0
19	37	42	Tandem Computers	1,424.7	1,089.6	30.8	1,424.7	100.0
20	38	46	Zenith	1,356.0	1,040.0	30.4	2,685.7	50.5
21	39	43	Seagate Technology	1,351.0	1,075.7	25.6	1,351.0	100.0
22	41	31	Data General	1,330.5	1,303.9	2.0	1,330.5	100.0
23	42	34	McDonnell Douglas	1,289.0	1,237.0	4.2	15,072.0	8.6
24	44	40	Computer Sciences	1,253.4	1,133.8	10.6	1,253.4	100.0
25	47	38	Comdisco	1,212.0	1,153.0	5.1	1,356.0	89.4
26	48	58	Arthur Andersen	1,198.5	748.9	60.0	2,976.5	40.3
27	52	48	National Semiconductor	1,018.0	985.0	3.4	2,666.8	38.2
28	55	54	Commodore	926.1	785.0	18.0	964.7	96.0
29	56	66	Computer Associates	925.3	648.8	42.7	925.3	100.0
30	58	57	Storage Technology	874.0	750.0	16.5	874.0	100.0
31	60	67	Intergraph	800.2	641.1	24.8	800.2	100.0
32	61	60	Motorola	790.0	724.9	9.0	8,250.0	9.6
33	64	61	Cray Research	756.3	687.3	10.0	756.3	100.0
34	65	63	Martin Marietta	743.4	685.7	8.4	5,727.5	13.0
35	66	76	Microsoft	718.6	456.7	57.4	718.6	100.0
36	67	84	Continental Information Systems	698.4	405.4	72.3	776.3	90.0
37	68	56	General Electric	675.0	750.0	(10.00)	50,089.0	1.3
38	70	68	Bell Atlantic	657.0	634.9	3.5	10,880.1	6.0
39	71	72	Apollo Computer	653.5	553.6	18.1	653.5	100.0
40	72	73	Lockheed	620.0	553.0	12.1	10,590.0	5.9
41	74	94	Miniscribe	603.3	362.5	66.4	603.3	100.0
42	75	78	3M	588.0	455.0	29.2	10,000.0	5.9
43	76	71	Texas Instruments	577.0	555.0	4.0	6,295.0	9.2
44	80	85	Emhart	508.9	404.8	25.8	2,762.5	18.4
45	81	87	Wyse Technology	488.7	396.2	23.4	488.7	100.0
46	82	88	Lotus	468.5	395.6	18.4	468.5	100.0
47	83	104	AST Research	459.0	289.8	58.4	459.0	100.0
48	84	77	Anacomp[1]	455.4	455.7	(0.1)	482.7	NA
49	86	91	American Express	446.9	383.8	16.4	22,934.0	1.9
50	87	96	MAI Basic Four	443.3	334.2	32.7	443.3	100.0

All currency figures are in millions. NA: not available or not applicable.

[1] Anacomp is treating its IS business as a discontinued operation pending sale and does not include it in total revenues.

1988 EMPLOYEES	% CHANGE FROM 1987	IS REV PER EMPL ($THOU)*	R&D		NET INCOME	% RETURN ON ASSETS	FISCAL YEAR END	LOCATION
			CORP 1988	AS % OF TOT REV				
387,112	(0.6)	154.2†	5,925.0	9.93	5,806.0	8.0	Dec.	N.Y.
124,400	6.5	98.8	1,447.5	11.78	1,209.1	11.8	July	Mass.
93,000	0.5	106.5†	1,419.5	14.34	680.6	5.9	Dec.	Pa.
87,000	6.1	113.0†	1,019.0	10.37	816.0	10.9	Oct.	Calif.
60,000	(3.2)	99.8†	416.0	6.95	439.3	9.3	Dec.	Ohio
10,836	49.9	409.2	315.2	7.11	419.3	18.4	Sept.	Calif.
33,657	(2.4)	107.8†	394.3	10.87	1.7	0.1	Dec.	Minn.
31,255	1.3	98.4	250.3	8.14	50.1	1.7	June	Mass.
100,123	1.1	164.2†	794.0	4.83	388.0	1.5	Dec.	Conn.
304,200	0.4	115.7†	2,572.0	7.30	(1,669.0)	NA	Dec.	N.Y.
6,000	50.0	344.3	74.9	3.63	255.2	16.0	Dec.	Texas
73,211	(6.1)	95.4†	1,879.0	26.91	260.6	5.9	Dec.	Ohio
50,407	16.1	96.1†	NA	NA	384.1	11.2	Dec.	Texas
8,300	9.2	217.1	221.0	12.27	223.3	11.6	Dec.	Calif.
37,000	2.8	107.9†	NA	NA	121.5	4.2	June	Texas
22,000	0	73.5	74.6	4.61	178.2	11.2	June	N.J.
12,500	41.8	127.5	174.0	10.92	19.0	1.2	Dec.	Mass.
8,253	51.0	177.1	191.8	13.12	89.6	9.2	June	Calif.
8,745	21.9	162.9	179.6	12.61	102.1	7.7	Sept.	Calif.
36,000	2.9	74.6†	100.6	3.75	11.7	0.8	Dec.	Ill.
26,000	10.7	52.0	56.7	4.20	(5.5)	NA	June	Calif.
14,810	(5.3)	89.8	164.2	12.34	(48.9)	NA	Sept.	Mass.
121,421	8.0	124.1†	610.0	4.05	350.0	2.9	Dec.	Mo.
19,800	7.6	63.3	NA	NA	49.5	6.9	Mar.	Calif.
1,503	33.0	902.2†	NA	NA	96.0	2.8	Sept.	Ill.
48,000	20	62.0†	300	NA	NA	NA	Aug.	Ill
39,000	2.6	68.4†	302.2	11.33	(18.1)	NA	May	Calif.
3,380	7.3	274.0	19.4	2.01	69.6	10.2	June	Pa.
6,400	60.0	144.6	110.0	11.89	142.4	12.3	Mar.	N.Y.
8,900	0.4	98.2	67.5	7.72	44.2	5.2	Dec.	Colo.
7,300	31.9	109.6	89.2	11.15	88.0	10.6	Dec.	Ala.
102,000	4.4	80.9†	665.0	8.06	445.0	6.6	Dec.	Ill.
5,237	21.6	144.4	117.8	15.58	156.6	15.8	Dec.	Minn.
67,500	(0.7)	84.9†	194.9	3.40	358.9	10.8	Dec.	Md.
3,500	75.4	205.3	87.3	12.15	151.4	25	June	Wash.
1,100	22.2	705.7†	0.0	0.00	(10.8)	NA	Feb.	N.Y.
298,000	(7.4)	168.1†	1,155.0	2.31	3,386.0	3.0	Dec.	Conn.
81,000	0.1	134.3†	NA	NA	1,316.8	5.3	Dec.	Pa.
4,446	11.4	147.0	76.9	11.77	2.1	0.4	Dec.	Mass.
86,800	(12.6)	122.0†	536.0	5.06	624.0	9.4	Dec.	Calif.
6,648	33.7	90.7	18.7	3.10	25.9	5.3	Dec.	Colo.
82,405	0	121.4†	650.0	6.50	1,154.0	12.9	Dec.	Minn.
75,000	(3.8)	83.9†	494.0	7.85	366.3	8.3	Dec.	Texas
32,991	8.0	83.7†	41.0	1.48	126.6	5.2	Dec.	Conn.
3,200	(11.1)	152.7	32.2	6.59	(6.9)	NA	Mar.	Calif.
2,563	20.9	182.8	83.8	17.89	58.9	14.0	Dec.	Mass.
2,025	32.8	226.7	17.4	3.79	4.3	1.6	June	Calif.
9,000	NA	NA†	NA	NA	32.8	3.4	Sept.	Ind.
100,000	17.6*	229.3†	NA	NA	1,038.0	0.7	Dec.	N.Y.
4,285	27.2	103.5	24.5	5.53	24.3	5.9	Sept.	Calif.

*For companies with more than 95% of revenues from IS.

†Based on total corporate revenues

The 100 Leading U.S. IS Companies

1988 US RANK	1988 WORLD RANK	1987 WORLD RANK	COMPANY	1988 IS REVENUE	1987 IS REVENUE	IS REV % CHANGE	1988 TOTAL REVENUE	IS AS % OF TOTAL REVENUE
51	88	154	NYNEX	430.0	180.0	138.9	12,660.8	3.4
52	89	79	Harris	425.0	446.0	(4.8)	2,104.8	20.2
53	90	142	Oracle	424.6	198.0	114.4	424.6	100.0
54	91	99	Science Applications	386.0	309.0	24.9	865.4	44.6
55	93	89	Shared Medical Systems	378.7	390.7	(3.1)	378.7	100.0
56	96	97	Dataproducts	364.5	334.2	9.1	364.5	100.0
57	97	95	Diebold	362.8	345.5	5.0	450.6	80.5
58	98	118	Atari	361.8	250.0	44.7	452.6	79.9
59	99	105	Micropolis	353.1	288.3	22.5	353.1	100.0
60	100	103	Eastman Kodak	350.0	290.0	20.7	17,034.0	2.1
61	102	204	Concurrent Computer[2]	342.0	80.8	323.3	342.0	100.0
62	103	123	Maxtor	339.0	239.4	41.6	339.0	100.0
63	104	98	Datapoint	333.3	320.7	3.9	333.3	100.0
64	107	121	Ernst & Whinney	315.0	242.0	30.2	2,191.0	14.4
65	108	145	3Com	309.9	197.5	56.9	309.9	100.0
66	109	92	Tandon	309.3	374.0	(17.3)	309.3	100.0
67	110	110	Ashton-Tate	307.3	267.3	15.0	307.3	100.0
68	111	139	Novell	306.8	202.1	51.8	306.8	100.0
69	112	129	Mentor Graphics	300.8	221.8	35.6	300.8	100.0
70	113	134	Everex Systems	298.6	210.1	42.1	298.6	100.0
71	115	101	Tektronix	292.2	295.4	(1.1)	1,431.0	20.4
72	116	116	Gerber Scientific	288.4	254.8	13.2	288.4	100.0
73	118	100	Gould[3]	275.0	299.3	(8.1)	NA	NA
74	119	111	Boeing	274.0	266.3	2.9	16,962.0	1.6
75	120	107	Genicom	273.9	284.9	(3.9)	291.4	94.0
76	121	122	Schlumberger	270.0	240.0	12.5	4,924.0	5.5
77	123	152	Stratus	265.3	184.1	44.1	265.3	100.0
78	124	128	Bolt Beranek and Newman	265.0	223.1	18.8	302.1	87.7
79	126	113	Recognition Equipment	261.5	265.2	(1.4)	261.5	100.0
80	128	171	Dell Computer	257.8	159.0	62.1	257.8	100.0
81	129	130	Intel	255.0	220.0	15.9	2,874.8	8.9
82	130	124	Reynolds & Reynolds	251.2	237.9	5.6	605.4	41.5
83	131	115	Management Science America	250.0	258.5	(3.3)	250.0	100.0
84	132	151	Decision Data	240.0	191.4	25.4	240.0	100.0
85	136	158	Touche Ross	235.0	175.0	34.3	1,840.0	12.8
86	137	141	Price Waterhouse	230.0	200.0	15.0	2,200.0	10.5
87	138	140	Digital Communications	226.5	200.6	12.9	226.5	100.0
88	139	164	Computer Task Group	218.7	170.1	28.6	218.7	100.0
89	140	155	Policy Management Systems	216.9	180.0	20.5	216.9	100.0
90	141	159	American Management Systems	213.5	174.3	22.5	213.5	100.0
91	142	136	Cullinet	211.5	203.9	3.4	211.5	100.0
92	143	161	Cipher Data Products	206.5	172.6	19.6	206.5	100.0
93	144	143	The Ultimate Corp.	203.9	197.7	3.1	203.9	100.0
94	145	144	General DataComm	203.2	197.7	2.8	203.2	100.0
95	146	162	Dun & Bradstreet	200.0	171.0	17.0	4,267.4	4.7
96	147	163	National Data	197.3	170.2	15.9	197.3	100.0
97	148	168	Systematics	197.0	163.5	20.5	197.0	100.0
98	149	180	Pansophic Systems	189.1	145.2	30.2	189.1	100.0
99	150	157	HBO	187.4	175.2	7.0	187.4	100.0
100	151	202	Wordperfect	178.7	100.3	78.1	178.7	100.0

[illegible]

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1988 EMPLOYEES	% CHANGE FROM 1987	IS REV PER EMPL ($THOU)*	R&D CORP 1988	R&D AS % OF TOT REV	NET INCOME	% RETURN ON ASSETS	FISCAL YEAR END	LOCATION
97,400	2.2	130.0†	200.0	1.58	1,315.0	5.2	Dec.	N.Y.
31,700	36.6	66.4†	122.0	5.80	69.6	3.4	June	Fla.
2,985	86.9	142.2	37.7	8.88	62.1	18.5	May	Calif.
9,876	14.0	87.6†	NA	NA	25.7	24.0	Feb.	Calif.
3,860	(10.2)	98.1	37.5	9.90	29.4	10.3	Dec.	Pa.
3,600	0	101.3	24.3	6.67	(11.3)	NA	Mar.	Calif.
4,560	(6.5)	98.8†	18.4	4.08	35.8	7.9	Dec.	Ohio
3,800	(1.3)	119.1†	27.2	6.01	(84.8)	NA	Dec.	Calif.
3,120	30.8	113.2	28.4	8.04	(19.4)	NA	Dec.	Calif.
145,300	16.8	117.2†	1,147.0	6.73	1,397.0	6.1	Dec.	N.Y.
3,450	NA	99.1	29.4	8.60	NA	NA	June	N.J.
3,200	28	105.9	23.6	6.96	11.0	3.8	Mar.	Calif.
2,743	(2.4)	121.5	10.9	3.27	7.2	1.9	July	Texas
35,600	14.1	61.5†	NA	NA	NA	NA	Sept.	Ohio
1,562	40.1	198.4	30.7	9.91	29.3	13.3	May	Calif.
1,484	(47.0)	208.4	13.7	4.43	(19.9)	NA	Dec.	Calif.
1,250	4.2	245.0	39.8	12.95	47.8	14.9	Jan.	Calif.
1,725	39.1	177.9	22.4	7.30	34.6	15.1	Oct.	Utah
1,700	41.7	176.9	33.8	11.24	33.5	11.9	Dec.	Ore.
1,800	38.5	165.9	16.5	5.53	11.7	7.1	July	Calif.
15,690	(7.0)	91.2†	205.3	14.35	(8.6)	NA	May	Ore.
2,000	8.1	144.2	19.8	6.87	31.7	12.7	Apr.	Conn.
NA	NA	NA	NA	NA	NA	NA	Dec.	Ohio
153,000	12.4	110.8†	751.0	4.43	614.0	4.9	Dec.	Wash.
3,600	0	80.9†	7.5	2.57	5.3	2.4	Dec.	Va.
48,000	(4.0)	102.6†	352.6	7.16	476.2	8.5	Dec.	N.Y.
1,711	39.8	155.1	30.6	11.53	29.3	14.7	Dec.	Mass.
3,100	8.7	97.5†	14.6	4.83	12.5	4.8	June	Mass.
2,673	(6.5)	97.8	7.6	2.91	(14.8)	NA	Oct.	Texas
1,200	NA	214.8	7.1	2.75	14.4	8.6	Jan.	Texas
20,800	8.3	138.2†	318.3	11.07	452.9	12.8	Dec.	Calif.
4,976	(12.8)	121.7†	12.8	2.11	22.1	5.6	Sept.	Ohio
2,369	(12.3)	105.5	58.9	23.56	(33.5)	NA	Dec.	Ga.
2,000	29.4	120.0	3.8	1.58	NA	NA	Nov.	Pa.
33,000	10.0	55.8†	NA	NA	NA	NA	Aug.	N.Y.
38,500	9.7	57.1†	NA	NA	NA	NA	June	N.Y.
1,497	14.5	151.3	27.2	12.01	39.2	16.0	June	Ga.
3,800	18.7	57.6	0.7	0.32	6.4	5.7	Dec.	N.Y.
3,011	16.8	72.0	36.3	16.74	20.5	NA	Dec.	S.C.
2,700	17.4	79.1	11.8	5.53	7.4	7.2	Dec.	Va.
2,523	3.9	83.8	47.1	22.27	(47.0)	NA	Apr.	Mass.
1,833	(0.9)	112.7	18.0	8.72	14.6	7.9	June	Calif.
653	(8.0)	312.3	0.0	0.00	(16.6)	NA	Apr.	N.J.
2,399	(8.5)	84.7	22.8	11.22	(11.3)	NA	Sept.	Conn.
69,000	15.0	61.8†	0.0	0.00	499.0	9.9	Dec.	N.Y.
3,900	11.4	50.6	1.4	0.71	18.1	8.5	May	Ga.
2,500	1.9	78.8	12.6	6.40	17.8	16.7	May	Ark.
1,437	11.3	131.6	7.0	3.70	(19.4)	NA	Apr.	Ill.
1,810	2.1	103.5	15.6	8.32	12.5	12.4	Dec.	Ga.
1,130	86.2	158.1	NA	NA	NA	NA	Dec.	Calif.

*For companies with more than 95% of revenues from IS

†Based on total corporate revenues

The 50 Leading Non-U.S. IS Companies

1988 NON-US RANK	1988 WORLD RANK	1987 WORLD RANK	COMPANY	1988 IS REVENUE	1987 IS REVENUE	IS REV % CHANGE	1988 TOTAL REVENUE	IS AS % OF TOTAL
1	3	4	Fujitsu	10,999.1	8,740.0	25.8	16,905.5	65.1
2	4	5	NEC	10,475.7	8,230.5	27.3	22,895.1	45.8
3	6	6	Hitachi	8,247.6	6,273.7	31.5	46,885.1	17.6
4	8	7	Siemens	5,951.0	5,703.0	4.3	33,812.1	17.6
5	9	11	Olivetti	5,427.9	4,637.2	17.0	6,445.5	84.2
6	11	10	Groupe Bull	5,296.7	4,964.8	6.7	5,296.7	100.0
7	13	12	Toshiba	4,226.6	3,441.4	22.8	28,759.0	14.7
8	14	17	Matsushita	3,441.0	2,628.5	30.9	40,721.9	8.4
9	15	20	Canon	3,391.6	2,371.0	43.0	8,631.4	39.3
10	18	16	Nixdorf	3,044.9	2,821.5	7.9	3,044.9	100.0
11	19	18	NV Philips	2,794.6	2,601.6	7.4	28,365.7	9.9
12	22	21	STC	2,425.1	2,123.9	14.2	4,193.6	57.8
13	23	45	Memorex Telex	2,078.5	1,041.1	99.6	2,241.8	92.7
14	25	32	Nihon Unisys	2,057.7	1,294.6	58.9	2,057.7	100.0
15	30	33	Ricoh	1,727.5	1,275.7	35.4	5,370.1	32.2
16	31	23	Alcatel	1,716.0	2,055.4	(16.5)	13,137.5	13.1
17	32	41	NTT	1,694.0	1,128.5	50.1	42,920.3	3.9
18	35	37	Seiko Epson	1,487.7	1,198.4	24.1	2,724.5	54.6
19	36	39	Oki	1,472.1	1,137.3	29.4	4,311.8	34.1
20	41	47	Atlantic Computers	1,341.6	1,028.4	30.5	1,350.5	99.3
21	44	44	Mitsubishi	1,270.7	1,047.7	21.3	18,518.9	6.9
22	46	35	Inspectorate International	1,230.3	1,225.0	0.4	1,688.3	72.9
23	47	49	Société Générale	1,222.6	970.1	26.0	5,214.2	23.4
24	50	83	Nokia	1,165.1	417.4	179.1	5,212.4	22.4
25	51	52	C. Itoh	1,075.9	829.2	29.7	118,622.2	0.9
26	53	64	Cap Gemini Sogeti	976.5	682.3	43.1	976.5	100.0
27	56	51	Northern Telecom	900.0	900.0	0.0	5,407.5	16.6
28	57	65	Econocom	897.0	674.3	33.0	897.0	100.0
29	59	59	Amstrad	841.8	730.2	15.3	1,108.7	75.9
30	62	69	Alps	785.2	632.5	24.1	2,970.5	26.4
31	63	62	Mannesmann Kienzle	779.0	686.0	13.6	940.2	82.9
32	69	80	CSK	660.0	428.7	53.9	1,040.9	63.4
33	73	75	Comparex	614.5	530.8	15.8	614.5	100.0
34	77	74	Racal Electronics	554.1	549.1	0.9	2,572.4	21.5
35	78	81	Finsiel	545.4	424.1	28.6	545.4	100.0
36	79	93	Sony	515.6	365.5	41.1	15,406.0	3.3
37	85	82	Norsk Data	450.2	422.6	6.5	450.2	100.0
38	92	102	Acer Group	379.4	294.0	29.0	529.1	71.7
39	94	146	Sema Group	375.1	197.2	90.2	474.9	79.0
40	95	106	SD-Scicon	366.4	287.0	27.7	394.3	92.9
41	101	125	Sligos	343.1	232.6	47.5	343.1	100.0
42	105	109	Samsung	330.1	276.8	19.3	4,580.0	7.2
43	106	117	Intec	326.0	253.8	28.4	326.0	100.0
44	114	135	Mitac	293.3	207.2	41.5	293.3	100.0
45	117	177	Nomura Computer Systems	278.0	150.8	84.3	695.1	40.0
46	122	150	Logica	269.9	194.6	38.7	269.9	100.0
47	125	127	GSI	262.8	230.5	14.0	262.8	100.0
48	127	108	Kyocera	258.5	281.6	(8.2)	2,584.9	10.0
49	133	119	Thorn EMI	238.4	246.1	(3.1)	5,434.2	4.4
50	134	137	Software AG	237.0	203.0	16.7	237.0	100.0

All currency figures are in millions. NA = not available.

NONDOLLAR CURRENCY					R&D			FISCAL
1988 IS	1987 IS	% CHANGE	COUNTRY	1988 EMPLS	CORP 1988	AS % OF TOT REV	NET INCOME	YEAR END
¥1,409,537.0	¥1,263,992.0	11.5	Japan	94,825	1,498.6	8.9	456.5	Mar.
¥1.342,462.0	¥1,190,314.0	12.8	Japan	105,486	2,008.6	8.8	573.8	Mar.
¥1,056,933.0	¥907,315.0	16.5	Japan	161,000	2,204.3	4.7	1,060.3	Mar.
DM10,450.0	DM10,250.0	2.0	W.Ger.	353,000	3,690.2	10.9	792.1	Sept.
L7,065,400.0	L6,014,300.0	17.5	Italy	57,560	307.3	4.8	345.7	Dec.
Fr31,547.0	Fr29,832.0	5.7	France	45,557	611.3	11.5	50.9	Dec.
¥541,641.0	¥497,700.0	8.8	Japan	129,000	1,841.6	6.4	600.5	Mar.
¥440,968.0	¥380,145.0	16.0	Japan	134,186	2285.8	5.6	1,471.0	Mar.
¥434,634.0	¥342,895.0	26.8	Japan	40,740	678.9	7.9	289.5	Dec.
DM5,346.8	DM5,071.0	5.4	W.Ger.	31,037	300.1	9.9	14.8	Dec.
G5,525.0	G5,270.0	4.8	Neth.	310,300	2,338.4	8.2	534.1	Dec.
£1,362.9	£1,299.0	4.9	U.K.	33,848	377.6	9.0	264.9	Dec.
G4,109.2	G2,108.9	94.9	Neth.	13,142	44.6	2.0	30.7	Dec.
¥263,700.0	¥187,227.0	40.8	Japan	7,616	NA	NA	27.5	Mar.
¥221,378.0	¥184,[illegible]90.0	20.0	Japan	33,000	336.8	6.3	121.2	Mar.
Fr1,450.0	Fr1,780.0	(18.5)	France	127,000	1,005.8	7.7	497.9	Dec.
¥217,081.0	¥163,201.0	33.0	Japan	279,983	1,322.4	3.1	1,322.3	Mar.
¥190,649.0	¥173,317.0	10.0	Japan	19,000	247.9	9.1	NA	Mar.
¥188,651.0	¥164,481.0	14.7	Japan	18,659	277.2	6.4	106.4	Mar.
£754.0	£629.0	19.9	U.K.	1,431	NA	NA	65.8	Dec.
¥162,838.0	¥151,519.0	7.5	Japan	75,795	1,011.4	5.5	307.0	Mar.
SFr1,800.0	SFr1,835.3	(1.9)	Switz.	7,698	NA	NA	90.2	Dec.
Fr7,282.0	Fr5,829.0	24.9	France	1,137	NA	NA	6.9	Dec.
Fmk4,877.0	Fmk1,835.0	165.8	Finland	44,600	249.6	4.8	259.7	Dec.
¥137,880.0	¥119,924.0	15.0	Japan	10,400	NA	NA	101.4	Mar.
Fr5,816.0	Fr4,100.0	41.9	France	12,000	48.9	5.0	67.5	Dec.
		0.0	Canada	50,136	710.6	13.1	165.6	Dec.
G1,773.4	G1,366.0	29.8	Neth.	1,600	NA	NA	NA	Dec.
£473.1	£446.6	5.9	U.K.	1,644	1.2	0.1	165.1	June
¥100,626.0	¥91,478.0	10.0	Japan	22,800	70.2	2.4	42.1	Mar.
DM1,368.0	DM1,233.0	10.9	W.Ger.	10,315	NA	NA	NA	Dec.
¥84,574.0	¥62,000.0	36.4	Japan	5,559	19.5	1.87	31.2	Sept.
DM1,079.0	DM954.0	13.1	W.Ger.	1,127	NA	NA	26.2	Dec.
¥311.4	¥335.8	(7.3)	U.K.	[illegible]	18.5	7.0	279.5	Mar.
L710,000.0	L550,000.0	29.1	Italy	4,912	28.5	5.2	16.1	Dec.
¥66,074.0	¥52,859.0	25.0	Japan	57,000	1,368.6	8.9	540.5	Oct.
NKr2,934.0	NKr2,847.0	3.1	Norway	4,100	44.8	9.9	(41.6)	Dec.
TAD10,864.2	TAD9,336.3	16.4	Taiwan	5,072	26.5	5.0	27.5	Dec.
£210.8	£120.6	74.8	U.K.	6,400	17.8	3.7	13.0	Dec.
£205.9	£175.5	17.3	U.K.	4,456	NA	NA	14.6	Dec.
Fr2,043.3	Fr1,397.4	46.2	France	NA	NA	NA	NA	Dec.
W241,460.0	W227,690.0	6.0	Korea	39,354	366.4	8.00	148.0	Dec.
¥41,783.0	¥36,702.0	13.8	Japan	2,350	7.4	2.27	12.6	Mar.
TAD8,400.0	TAD6,580.0	27.7	Taiwan	1,200	14.7	5.01	20.5	Dec.
¥35,632.0	¥21,815.6	63.3	Japan	2,300	NA	NA	NA	Sept.
£151.7	£119.0	27.5	U.K.	3,400	NA	NA	19.0	June
Fr1,565.0	Fr1,385.0	13.0	France	9,340	16.1	6.13	10.4	Dec.
¥33,125.0	¥40,728.8	(18.7)	Japan	12,307	84.3	3.26	196.6	Mar.
£134.0	£150.5	(11.0)	U.K.	64,000	154.8	2.85	266.9	Mar.
DM416.2	DM364.9	14.1	W.Ger.	2,700	NA	NA	NA	Dec.

At the Top Of the IS Peak

The inside stories of the 100 most successful IS vendors in the world, reported by DATAMATION's international team of correspondents.

Asia, Europe and North America are the three great sources of information systems innovation and products. This year's roster of the 100 most successful IS vendors lists 61 North American companies, 22 European companies and 17 Asian companies. They are profiled in the following pages* by 20 DATAMATION editors and contributors, based in nine countries around the world, who follow the companies year-round.

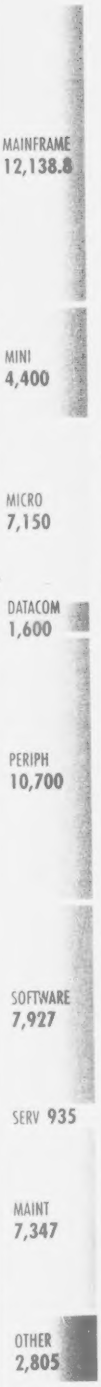
The story told in these 100 profiles is a rich one: the total IS revenues of these vendors comes to $243.1 billion in 1988, almost 17% higher than the IS revenues of 1987's top 100 vendors. Only five vendors had lower IS revenues in 1988 than in 1987. Still, in 1988, the story of IS was not without its perils. Revenue and profit growth were down from 1987, and some companies made it through the year by the skin of their teeth. Some, accustomed to high flying, found ceilings limited. Still others scored revenue growths that dazzled.

The revenues of these 100 vendors represent approximately 80% of the entire worldwide IS market. IS is a global business: almost all of these stellar vendors operate worldwide. But for many, "international" equals "multilocal"—the vendors operating independent business units close to their widely scattered customers. To help you locate the multiple revenue sources of these companies, many of the profiles contain charts that show just where in the world these vendors are earning their money. Detailed 1988 financial data on the companies, including comparisons with their 1987 performances, begins on page 22 for U.S.-based companies, on page 28 for non-U.S.-based companies. Other tables comparing some companies' performances in eight specific market sectors can be found in Technology Insights, beginning on page 149.

To find profiles of individual companies, please see the index on page 148.

A Full Dance Card For Big Blue

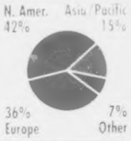
Partnering with its rivals, IBM looks to regain momentum. Can the monster do the Niche Step?



REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

1
Total DP Revenues
55,002.8

INTERNATIONAL BUSINESS MACHINES CORP.
Old Orchard Road
Armonk, NY 10504
(914)-765-1900



If 1987 was its "year of the customer," last year could be tagged as International Business Machines Corp.'s "year of the partner." IBM offered its proprietary chips to archrival Digital, joining the minimaker in an anti-AT&T, multicompany UNIX consortium. The same chip technology was also offered to IBM's mainframe rivals. Siemens AG, IBM's biggest competitor in Europe, was another unlikely ally. The two got cozy in a joint marketing venture, and IBM's new German friend made a deal to buy the development and manufacturing arms of IBM's telecom company, ROLM. Another old nemesis was also offered the hand of friendship—former Apple chief, Steve Jobs. IBM is paying him millions to use NeXT Computer Inc.'s user-friendly interface.

Even the Japanese are receiving friendly overtures. A dozen or so joint ventures are under way with the likes of Nippon Steel, Nissan and Sumitomo Electric Industrial, and Japanese customers can buy Big Blue mainframes with Japanese clone operating systems.

IBM's web of alliances is now so complex that nobody can keep track. Its worldwide network of value-added resellers (VARS) and marketing partners is thousands strong and growing. Then there's the minority stake, typically 10 to 20%, which IBM is now fond of taking in entrepreneurial ventures that augment its own products. Metaphor Computer Systems Inc., a maker of data retrieval software, is an example, as is IBM's equity in the supercomputer venture Supercomputer Systems Inc., formed by Cray Research Inc. breakaway Steve Chen.

The partner IBM most wants, of course, is the customer. IBM's uniqueness had been its ability to support the whole account: products, hand-holding, industry know-how—IBM had it all. But in recent years such expertise has been obscured by a calcified bureaucracy and lackluster products. Then in 1988 a major turning point came about both in IBM's relations with customers and in its products.

The giant's U.S. operation splintered into five lines of business (six, if you count its revamped marketing organization), each with decentralized decision-making and product responsibility. IBM regained lost ground in both the mainframe and minicomputer arenas. Its 103MIPS-plus 3090S model returned the company to the top of the big iron league. But it was the AS/400—"one of the most successful products in IBM's modern history," to quote IBM chairman John Akers—that really captivated customers. The machine's bundled blend of data base, applications and friendliness is an embodiment of IBM's whole solution strategy. Over 30,000 of them were shipped between July 1988 and January 1989, constituting a $3 billion-plus business built from scratch in just six months.

John Akers, IBM CEO, partner of partners

The newly elected head of IBM's Entry Business Systems, Jim Cannavino, said in March that IBM is now "winning the battle for customer mind share" at the PC end. He says customers and software writers seem readier than ever to commit to IBM's OS/2 operating system and MicroChannel bus; they are reluctant to wait for an alternative from the clone consortium, the Extended Industry Standard Architecture, the so-called "Boys on the Bus."

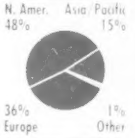
IBM's U.S. business shrank in 1986 and 1987 and was flat last year. One big reason: the sales force was geared to selling boxes at a time when, as IBM marketing head George Conrades puts it, the IS budget is "over 50% human resources." That all changed this January. Now, sales force compensation is determined by revenue per account, as opposed to quotas of boxes sold.

Whether through partnerships, corrections of past sins or the elimination of marginal operations, 1988 was a turning point for IBM. Earnings grew a healthy 10.4% to $5.81 billion and sales were up a respectable 8% to just shy of $60 billion. ▭

2
Total DP Revenues
12,284.7

DIGITAL EQUIPMENT CORP.

146 Main Street
Maynard, MA 01754
(508)-897-5111



There's a side to Digital Equipment Corp. that hadn't been evident since the late 1970s. The company isn't the surging, confident Digital of recent years; it's a more defensive company whose demeanor recalls behavior of more than a decade ago.

Before the VAX computer era began almost a dozen years ago, a series of smaller rivals challenged Digital and its then 16-bit PDP-11 mainstay with much faster and more powerful, 32-bit computers. These upstart computer makers, such as Prime Computer Inc., grew quickly at the expense of Digital, whose first VAX computer appeared several years later. While the growth of Digital and its 32-bit VAX family has overshadowed its competitors, there was plenty last year to echo the pre-VAX days.

In 1988, Digital was nettled by a group of younger and faster moving companies. These upstarts, none of which was even formed until the 1980s, include workstation and software companies COMPAQ Computer Corp., Novell Inc. and Sun Microsystems Inc. In 1988, Digital found itself on the defensive, even as it marshaled new attacks on IBM's heartland. Although still able to enter the transaction-processing and systems integration services markets, it was as much occupied with securing established bases in engineering and work group systems as it was with landing fresh blows against the Big Blue empire.

These upstarts, and the market forces they represent, forced Digital to revise its single architecture plan. Through alliances with Mips Computer Systems Inc. and Tandy Corp., Digital prepared a series of UNIX and MS/DOS workstations to challenge Sun and Compaq. A low-cost PC LAN took aim at Novell.

Still, Digital's blurring market focus did not lead it to neglect its commercial-systems tack, and it unveiled new high-end VAX computers and transaction-processing software to pressure IBM's data center stronghold. The flagship VAX was upgraded and expanded at every turn. The individual high-end, midrange and low-end computers once offered by the company have grown into separate families.

Despite these moves, weaker-than-expected sales of the VAX 8800 series reversed the company's recent record of ever-increasing earnings. Profits fell nearly 6% to $1.21 billion despite an 18% increase in sales. Non-U.S. sales exceeded the U.S. results for the first time, accounting for 52.4% of the company's $12.27 billion annual revenues.

If competition in 1988 suggested the late 1970s, there was still another reason for déjà vu: Digital disclosed plans for a new computer architecture. Called Application Integration Architecture, this software environment carries the VAX to the world of heterogeneous computing and industry standards. More important, it introduces Digital to the desktop-focused, and typically UNIX world, of its smaller competitors.

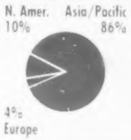
MINI	3,735.6
MICRO	50
DATACOM	225
PERIPH	3,166.2
SOFTWARE	794.6
SERV	216
MAINT	3,882.3
OTHER	215

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

3
Total DP Revenues
10,999.1

FUJITSU LTD.

Marunouchi Center Building
6-1 Marunouchi 1-chome
Chiyoda-ku, Tokyo 100, Japan
(81-3)-216-3211



Fujitsu Ltd. passed two information systems milestones last year. One—bragging rights to the world's fastest computer—proved short-lived, but two marketing agreements portend major changes in the company's systems business. Having previously supplied semiconductor and central processor development expertise to Sun Microsystems Inc. and Amdahl Corp., respectively, Fujitsu turned to the pair to supply new systems for its domestic market.

In August, Fujitsu entered the fast-growing Japanese market for engineering workstations by licensing Sun's RISC-based Scalable Processor Architecture (SPARC). Less than two months later, Fujitsu introduced the Amdahl 5990-1400 and 5990-700 in Japan. The pair, which compete against IBM's ES/3090 mainframes, are Fujitsu's first fully IBM software-compatible mainframes.

The SPARC-based Fujitsu S family workstations mark the company's first entry into the UNIX engineering workstation business, which in Japan grew an estimated 250% in unit shipments during 1988. Analysts estimate that Japanese sales of workstations rose to 70,000 units from 20,000 the year before.

The agreements reflect new efforts to revitalize Fujitsu's mainframe-oriented IS business. IS revenues for 1988 grew 11.5% to ¥1.4 trillion ($11 billion), slower than the growth rate of the prior two years. Moreover, its IS business failed to match the company's overall revenue growth rate.

In December, Fujitsu started selling eight models of its newly developed FACOM VP 2000 series supercomputer. One model, the VP2600, is capable of 4 billion floating point operations per second (FLOPS) vector-processing speeds. But its claim to the title of the world's fastest supercomputer was short-lived, as NEC soon introduced a faster machine.

Among its international ventures, Fujitsu consolidated three of its U.S. voice and data communications operations into a single operating unit, Business Communications Systems Inc. The Anaheim, Calif., operation brings together development, manufacturing, sales and service organizations into one unit. As a part of the consolidation, Fujitsu acquired GTE Corp.'s 20% interest in Fujitsu GTE Business Systems.

While relying on partners for an infusion of systems, Fujitsu's commitment to research and development was displayed at Fujitsu Technology '88, a show held to mark the opening of a new technology center. On display were neurocomputer-based robots and AI systems; a coherent light wave communication system capable of multiplexing thousands of image or millions of voice signals; a 512 megabits per second photonic switching system; and advances in component technology, including a 4-bit Josephson Junction-based microprocessor and a biosensor that incorporates biological material.

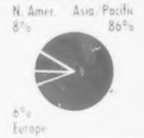
MAINFRAME	4,184.9
MINI	991.2
MICRO	595.3
DATACOM	816.7
PERIPH	2,728.5
SOFTWARE	676.1
MAINT	1,006.4

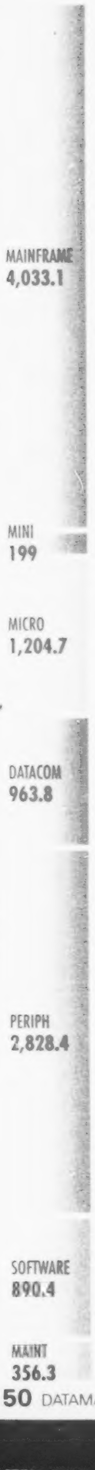
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

4
Total DP Revenues 10,475.7

NEC CORP.

33-1 Shiba 5-chome
Minato-ku, Tokyo 108, Japan
(81-3)-454-1111





In 1988, NEC Corp. introduced new computers in all of its product lines, but the biggest potential money-maker is its new SX-3 line of supercomputers. Introduced on April 10, 1989, the SX-3s are expected to be up to eight times faster than the most powerful U.S.-made supercomputers.

The computers use 20,000-gate large-scale integration (LSI) chips with 70-picosecond switching speeds to perform as many as 2 billion operations per second. They are also available in multiprocessor versions that NEC did not previously manufacture. The speeds of single-processor SX-3 machines range from 1.37 to 5.5 billion floating point operations per second and from 5.5 to 22GFLOPS for multiprocessor models. NEC has developed a new Super-UX operating system based on AT&T's version of UNIX as well as on the SXOS operating system that has been used on NEC supercomputers up until now.

While some observers question whether the SX line's technological edge will cause many loyal users of Cray Research Inc.'s supercomputers to jump ship, the SX's arrival has created a furor of anxiety in Washington over the issue of keeping the United States in the lead in that market. Cray currently owns 66% of the worldwide market for supercomputers.

NEC is still loyal to its C&C strategy, formulated in 1977, by which it is committed to integrating computers and communications, to developing new digital communications and to distributed data-processing platforms.

IS sales in the first half of 1988 were slow but picked up by the end of the year to reach ¥1.3 trillion ($10.5 billion), 12.8% over 1987's levels. IS revenues constituted 46% of total sales. Net income was up 144.5% to ¥73.5 billion ($573.8 million).

In software, NEC began delivering its Distributed Information Processing Systems Architecture, announced in December 1987. The software provides an environment in which data and applications software can be shared easily among all of NEC's hardware products, from PCs to supercomputers.

Strong growth in hardware sales in 1988 was exemplified by increased demand for the small-scale System 3300 mainframe and for 32-bit PCs. Compact size and integrated networking capabilities apparently were the reasons the System 3300, unveiled in July 1987, got a favorable reception in 1988. Stronger domestic demand for 32-bit PCs contributed substantially to the company's growth; NEC accounts for almost half of that market in Japan.

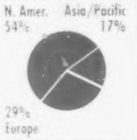
Another product segment receiving rapidly increasing attention from NEC is the office, or small-business, computer. These computers, which NEC calls SBCs, feature high processing speeds, are easy to use and can be networked in a typical office environment. NEC introduced in 1988 the System 3050 and 3100 series of SBCs.

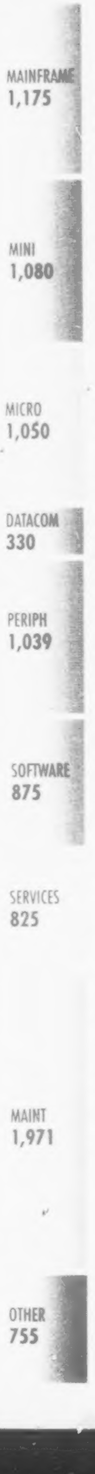
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

5
Total DP Revenues 9,100

UNISYS CORP.

Township Lane and
Union Meeting Roads
Blue Bell, PA 19424
(215)-542-4011





After reporting higher-than-expected first-quarter earnings—up 35.5% over the previous year—Unisys Corp. saw both its revenue and earnings gains shrink through the rest of the year. By the fourth quarter, Unisys could muster only a 2.7% revenue increase, and earnings were essentially flat compared with the previous year's fourth quarter. Those results kept Unisys' total revenue increase for the full year to less than 2% and held its earnings increase to 17.7% since 1987. For the year, Unisys' revenue growth from IS products was only slightly better at 2.2%. Unisys' 1988 IS-related revenue was $9.1 million. While Unisys' revenues from international operations grew 6.6% in 1988, domestic revenues dropped nearly 2%.

The late 1988 downturn at Unisys was attributed to a slowdown in U.S. demand for large systems, as well as a troublesome product transition and the costs engendered by a corporate reorganization.

The long-awaited product transition in the company's important 1100 mainframe product line did not add to 1988 revenues. On the contrary, while two key replacements for the aging 1100 line were announced in March of 1988, Unisys did not ship them in any volume until early 1989. The midrange 2200/400 and the high-end 2200/600 use advanced complementary metal-oxide semiconductor (CMOS) technology to achieve improved performance, along with reductions in power consumption and size. As expected, there was plenty of pent-up demand for the new models, but orders for older products dried up and Unisys revenue suffered.

As a result of the revenue atrophy, Unisys announced early in 1989 that it would trim its work force sooner than expected, eliminating 2,500 jobs to bring the number of employees down to 90,000.

Unisys continued to invest in its thriving commercial UNIX- and network-based businesses, up by about 15% in revenues in 1988. Unisys estimates its UNIX and desktop computer business has accounted for about $2 billion in annual revenues, including hardware, software and services. Unisys increased its research and development spending in 1988 by 19% to $713 million, much of that increase going into UNIX and desktop systems.

Unisys bolstered its position as a vendor of networked UNIX desktop systems by acquiring Santa Clara, Calif.-based Convergent Technologies Inc. for $350 million. Prior to the deal, Unisys had purchased workstation and UNIX products from outside OEM vendors such as Convergent Technologies Inc. and NCR Corp. Unisys continues to resell some UNIX and desktop products made by other companies.

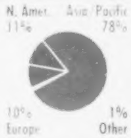
Unisys has said it expects continued revenue weakness in the first half of 1989, despite solid international business. But it expects volume shipment of new products such as the 2200/400 and 2200/600 to bolster second-half revenues and earnings.

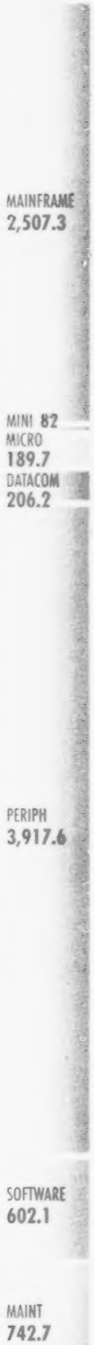
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

6
Total DP Revenues
8,247.6

HITACHI LTD.

6 Kanda-Surugadai 4-chome
Chiyoda-ku, Tokyo 101, Japan
(81-3)-258-1111





Last year was eventful, to say the least, for Hitachi's Ltd.'s relationship with U.S. computer vendors.

Motorola Inc. and Hitachi have jockeyed back and forth in U.S. courts, variously dismissing, refiling and moving their respective patent infringement claims after Motorola alleged that Hitachi had infringed on its microcontroller patents. Ironically, the two companies have a long history of technical exchanges and cross-licenses dating from the mid-1970s and had made agreements to act as second sources for some of each other's products, including Motorola's 6809 and 68000 microprocessors and Hitachi's 6301 CMOS microcontroller and 6845 CRT controller. Hitachi has asserted that no infringement exists and that the H8 unit in question is a licensed Motorola patent.

Hitachi and Electronic Data Systems Corp. also began negotiations last year to jointly purchase National Advanced Systems from National Semiconductor Corp. for $400 million. When these negotiations are completed this year, the acquisition of Santa Clara, Calif.-based NAS will give Hitachi an 80% stake in a plug-compatible manufacturer OEM partner in the United States.

Computers, semiconductors and other computer equipment were the leading profit makers for Hitachi last year, bringing 1988 total sales up 25.6% to ¥6 trillion ($46.9 billion). IS sales were up 16.5% to ¥1.1 trillion ($8.2 billion). Net income was up 27.9% to ¥135.9 billion ($1.1 billion).

In response to changing domestic market requirements, Hitachi released several new products last year. The M-620, M-630 and M-640 are compact, high-performance low- to midrange general purpose computers. The M-620 is seen as a departmental computer, filling the gap between end users' workstations and central mainframes.

For smaller scale distributed systems, Hitachi introduced the E-7700 series of superminicomputers. In the workstation sector, the firm is marketing models with 32-bit processors and enhanced graphics capabilities. In January, the company announced a prototype of the 32-bit GMicro, which it has been developing jointly with Fujitsu Ltd. and Mitsubishi Electric Corp. Hitachi has also designed a laptop PC with an eight-color thin film transistor liquid crystal display. The new laptop, the HL400C, is based on a 12 megahertz Intel Corp. 80286 microprocessor. Hitachi's 1988 microcomputer sales were up 27.9% to ¥24.3 billion ($189.7 million).

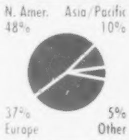
In software, the company announced Hitachi Application Architecture (HAA)—similar to IBM's Systems Application Architecture (SAA)—which will enable Hitachi systems of all sizes to use the same software. In addition, the company brought out Software Engineering Workbench (SEWB), a set of applications for improving software development.

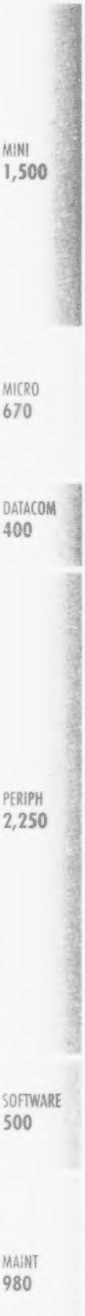
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

7
Total DP Revenues
6,300

HEWLETT-PACKARD CO.

3000 Hanover Street
Palo Alto, CA 94304
(415)-857-1501





As it enters its 50th year of business in 1989, Hewlett-Packard Co. can boast about good financials and gloat that reduced instruction set computing (RISC) is finally becoming a household word. Now, HP is beginning to enjoy the fruits of Spectrum, its massive RISC-based computer architecture project. However, chief executive officer John Young reflects, "We're still kind of feathering down from the large investments we made in our Spectrum program and networking projects."

Until September, it looked as if HP might land with a thud. That's when HP finally got out what's considered the first legitimate working release of its MPE-XL operating system, without which users were hesitant to commit to commercial HP 3000 Spectrum minicomputers. Now orders are picking up. But, orders for HP 9000 Precision Architecture machines running UNIX outshone expectations all year long. Recognizing a good thing when it saw it, in May HP became a cofounder of the UNIX-oriented Open Software Foundation, and HP executive vice president John Doyle is currently serving as OSF chair.

HP's real shining stars were found outside its traditional mini business. Along with workstations, personal computer products and peripherals did well. In fact, while orders for all HP information systems increased by 26%, peripherals did even better, growing by nearly 30%. The year also saw the shipment of the one millionth HP LaserJet printer.

For the fiscal year, ended October 31, net revenue and income both climbed at a faster pace than they did in 1987. Revenue jumped 22% to $9.8 billion while earnings increased 27% to $816 million. Orders met HP's goal, going over the $10 billion mark. International orders grew 29%, accounting for about 52% of HP's total business.

No year is complete at HP without a corporate reorganization. Chief operating officer Dean Morton no longer manages all the business sectors; some of the load has been transferred to chief executive Young. And in October, the computer business was realigned into the Computer Products Sector—oriented toward PCs and workstations primarily sold through indirect channels—and the Networked Systems Sector—for multiuser systems or those products sold directly.

External organizational moves included a networking alliance with Northern Telecom Ltd., the purchase of a 10% interest in Octel Communications Corp. and, in early 1989, the decision to purchase 5% of 3Com Corp. HP also announced that it will join the growing ranks of computer companies willing to service third-party equipment.

After two years of no growth in employment, HP added 5,000 new workers in 1988, reaching a total of 87,000 employees worldwide. "By and large, we're looking forward to another pretty strong year for Hewlett-Packard," chief executive Young says.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

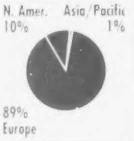
Focusing on narrow niches such as CAD/CAM is a marketing strategy evident at many of the Top 100 companies. Few have enough resources to compete on a broad scale.

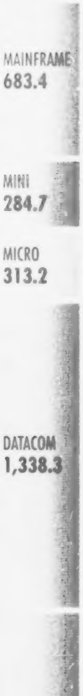
8

Total DP Revenues 5,951

SIEMENS AG

Wittelsbacherplatz 2 D-8000
Munich 1, West Germany
(49-89)-2340





West Germany's Siemens AG, Europe's largest indigenous IS supplier, suffered plummeting IS revenue growth last year—down to only 2% in 1988, on revenues of DM10.45 billion ($5.95 billion at DM1.76 = $1), compared with a healthy 7.7% surge the previous year.

This slowdown, combined with a softening of the European office systems business and the prospect of a single European market after 1992, galvanized the traditionally cautious company into action. It began its first major management shake-up since 1969, launched an aggressive expansion campaign to improve its international operations and established a long-overdue worldwide support program for its multinational IS users.

On the product side, there was little movement in sales of IS systems, despite the launch of new SINIX-based workstations and laser printers. However, Siemens' personal computer business improved markedly—up by around 50%. Furthermore, and the marketing focus on the Hicom PBX—1988 was designated the Year of Hicom by Siemens—seems to have paid off. Around 750 of the systems were sold last year.

Acquisitions, mergers and joint ventures are high on the list for the new Siemens. President and chief executive officer Karlheinz Kaske states that he "will consider any opportunities that present themselves, so long as they fit into our strategic concept."

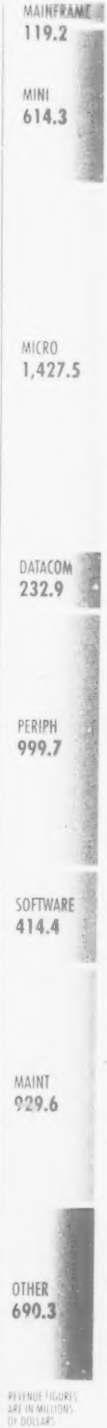
As part of this expansion plan, Siemens joined forces with the London-based electronics giant General Electric Co. (GEC) last November in a hostile bid to acquire British communications specialist The Plessey Co. PLC. The deal is still dragging on, but if successful it will give Siemens part ownership of the Coventry, U.K.-based GEC Plessey Telecommunications Ltd. subsidiary and will significantly improve the company's access to the British domestic defense electronics market.

Last December, Siemens surprised the industry again by announcing a joint venture with IBM in the PBX sector built around IBM's ROLM Corp. subsidiary, which IBM acquired in 1985. Siemens picked up the development and manufacturing side of ROLM, part ownership of the U.S. marketing arm and a deal to supply its Hicom digital switch for IBM to sell in Europe.

That deal followed the company's other major U.S. venture in 1988 with Intel Corp. to create a new company, BiiN, in Hillsboro, Ore. That company will develop mission critical systems in both the United States and West Germany.

With these deals under way, Siemens also began shuffling thousands of employees into a new corporate structure that will eventually comprise between 15 and 20 flexible and independent business groups. Meanwhile, the company's work force was slashed by 6,000 at home in West Germany.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

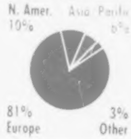


Restructuring For the New Realities

Olivetti shakes itself up to restore profit margins and prepare for 1992.

9
Total DP Revenues 5,427.9

ING. C. OLIVETTI & CO. SPA
Via G. Jervis, 77 10015
Ivrea, Italy
(39-125)-525



Squeezed by tighter margins, hit by profit shortfalls and caught by markets that are becoming ever more product specific, Italy's Ing. C. Olivetti & Co. SpA announced in late 1988 that it was embarking on a massive restructuring program. Much of this reshuffling was due to Vittorio Cassoni, who was called back in May from the United States, where he had been on loan from Olivetti, heading up AT&T's data systems division since November 1986. In the new structure, Cassoni became comanaging director, along with chairman Carlo de Benedetti.

Vittorio Cassoni, Olivetti's remaker.

To compete with Pacific Basin suppliers and Japan Inc., Olivetti formed a new Olivetti Office division for mass-consumption products such as typewriters, text processors, facsimile and copying machines.

The Olivetti Systems and Networks group competes with Digital, IBM, NCR and others in the area of application solutions based on distributed data processing. The group's product line comprises a wide range of PCs and workstation systems, minis, networks and Hitachi Ltd. IBM-compatible mainframes for the Italian and Spanish markets.

Olivetti Information Services was formed for systems integration and services and competes with companies such as Electronic Data Systems Corp. and France's Cap Gemini Sogeti.

What motivated this regrouping was a worsening drop in profits during the year, which left annual income down 11.5% to L.356 billion ($273.4 million). Company revenues were up 14% to L.8,407 billion ($6.5 billion), and IS revenues grew 17% to L.7,065 billion ($5,4 billion). Profits had already dropped by 30% during the previous year. Nevertheless, all product areas showed growth. Olivetti is having trouble building up its minicomputer sales, despite a wide range of products, including its own LSX line, AT&T's 3B systems and Stratus Computer Inc.'s fault-tolerant systems. Minicomputer sales were only up 2% to L.799.6 billion (or $614 million).

Through 1988, Olivetti continued to push efforts to integrate its products with other manufacturers' systems, part of the company's Open Systems Architecture (OSA). Olivetti and Digital agreed to exchange technology to allow integration of Olivetti PCs into Digital networks, using Digital's Network Applications Support. The Digital link has since become considerably stronger, following a deal in April of this year for Olivetti to supply Digital with PCs for European distribution.

Olivetti Systems and Networks presented a new series of PCs, called P500 and P800. They are based on the Intel 386SX microprocessor and use IBM's MicroChannel Architecture. Olivetti and U.S.-based Stratus agreed to develop a fault-tolerant version of UNIX for Stratus' fault-tolerant computers, making them compatible with Olivetti systems.

Olivetti has a long history of investment in smaller technology companies around the world. Its portfolio currently contains around 240 companies including Acorn Computers in Britain, Bunker Ramo in the United States, Scandinavian Scanvest-Ring and Triumph Adler in West Germany. Cassoni's main job now is to pull together these disparate elements and create coordinated product lines across the organization. The new restructuring and the concentration on OSA are going to help make that job easier. Standing in Cassoni's way is a fast-changing European PC market, AT&T's increasing distance from the company, despite its 24% stake, and its recent decision to look elsewhere for PCs for the United States this year.

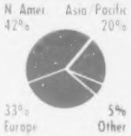
Then there's 1992 on the way. As Cassoni puts it, there will have to be more than just an internal restructuring of European companies in the advance toward a unified European market. There will have to be a restructuring of the whole industry. "There are too many of us," he says.

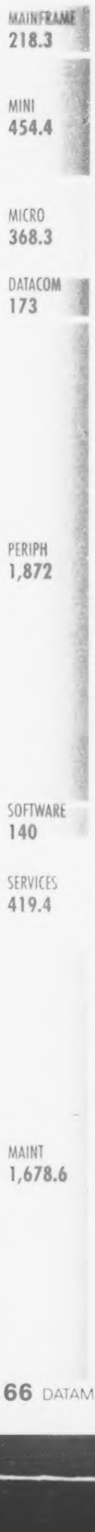
10

Total DP Revenues 5,324

NCR CORP.

1700 South Patterson Boulevard
Dayton, OH 45479
(513)-445-5000





Bob Neese, a 20-year NCR Corp. customer and executive vice president of operations at Cape Cod Bank & Trust Co. in south Falmouth, Mass., has one burning question: When will NCR produce a top-of-the-line system he actually wants to buy? Like many other IS chiefs, he believes that NCR's 9800 flagship mainframe is woefully underpowered and bereft of really useful software. "We're just lying back and waiting for them to iron out the kinks," he says, echoing the thoughts of hundreds of other NCR computer customers who paused to reflect in 1988 and didn't buy.

Although there was still momentum last year—revenues inched up 6.2% to just under $6 billion, and profits rose 4.7% to $439.3 million—NCR's order book took a big hit. As a result, the company's 1989 outlook is gloomy.

NCR's chief executive officer, Charles Exley, has built up a number of successful side businesses: ATMs (an area in which NCR is a leader), UNIX-based supermicros, communications processors and PCs. But without the 9800, there would be no center. NCR's on-line transaction-processing mainframes are the way the company differentiates itself and the way it adds value with proprietary products in a world it helped usher in: the world of open systems, of micros and of standard software. Without the mainframes, NCR would be just another value-added reseller of standard technology. Such a possibility has caused growing numbers of large customers to defect to IB and Tandem Computers Inc. in recent years.

To stop the rot, Exley has shifted his research and development effort into high gear. Spending grew nearly 17% in 1988 (reaching the industry average of 7% of revenue) and will climb another 15% this year. Two new 9800 processors, one for applications and one for data storage, were unveiled in December. Respectively, they offer 60% and 30% greater performance at no increase in the total cost of ownership, NCR claims. To increase the 9800's attractiveness as a host, the company is now offering the first software to integrate it with its line of Tower UNIX processors and a variety of local and wide area network schemes. Since new applications are scarce on the mainframe, a new UNIX-based software development platform, the NCR Union, has been added.

The Tower family, a nearly $500 million business, was started in 1982 and is now under mounting pressure from Digital, Hewlett-Packard Co. and IBM, among others. These competitors offer their UNIX systems as part of a total integrated architecture: one-stop shopping. So, NCR must do the same. NCR hopes to consolidate its 9800 and its new 10000 series multiuser minis around one RISC-based (reduced instruction set computer) platform, say insiders of another R&D program that is expected to bear its first fruit in 1990.

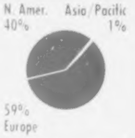
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

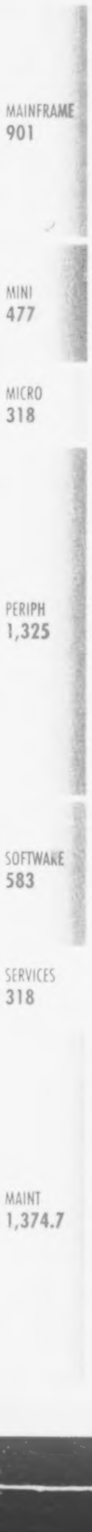
11

Total DP Revenues 5,296.7

GROUPE BULL

121 Avenue de Malakoff
75116 Paris, France
(33-1)-45 02 90 90





By the end of last year, France's Groupe Bull, in which the French government has a 92% holding, had established solid control of the global heritage of Honeywell Inc. The result: one of America's best-known pioneering computer companies is now owned by the people of France.

Bull increased its stake in its Honeywell Bull Inc. U.S. subsidiary from 42.5% to 65.1% in 1988—reducing Honeywell's stake to 19.9% and leaving NEC Corp.'s share unchanged at 15%. The U.S. company was renamed Bull HN Information Systems Inc.

Therefore Groupe Bull was able to announce consolidated worldwide IS revenues of FF31.5 billion ($5.3 billion) for 1988. France's share of those revenues amounted to no more than 39.9%, with North America contributing 18%, the rest of Europe chipping in 36.1%, and 6% coming from Asia and Africa.

However, the group's consolidated net earnings of FF303 million ($51 million) were generated solely by the French-based company, Bull SA, which operates in all European markets (apart from Britain ahd Italy), as well as in Africa, the Middle East, the Far East and South America. Bull HN in the United States did no more than break even. That was still an improvement. Although the U.S. operation reported a profit of $17 million in 1987, it was entirely due to exceptional gains of $34 million, so it actually had an operating loss of $17 million.

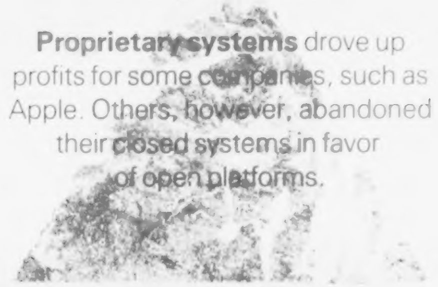
Bull improved its sales and earnings performance on both sides of the Atlantic in 1988, with average gross margins widening to 44.6% from 43% in 1987. The greatest setback for Bull in 1987 had been in its home turf, where sales actually fell. That situation was reversed in 1988, when French revenues advanced by 7%. At the same time, sales growth was even stronger elsewhere in Europe. In the United States, chief executive officer Roland Pampel says, Bull HN has completed "its overhaul phase" and is putting the emphasis on sales growth rather than on profitability over the next three years.

The outstanding new product launched by Bull in 1988 was undoubtedly its DPS 9000 business system, which runs on the GCOS 8 operating system.

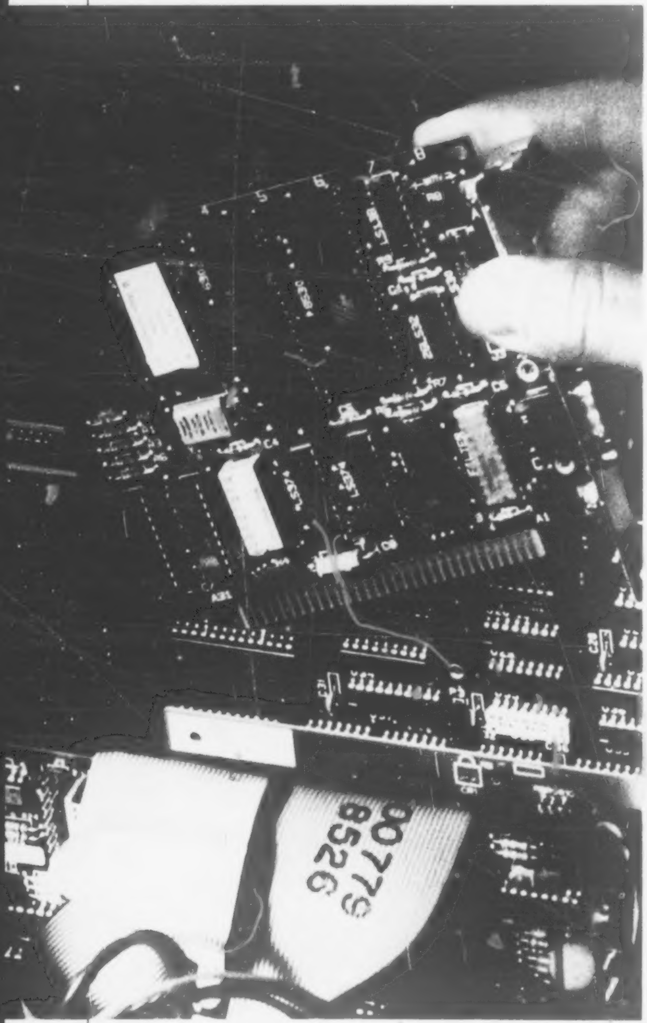
Bull also announced the renewal of its DPS 4000 small business systems and enhancements to its popular DPS 7000 departmental systems during 1988. It grasped the open systems nettle with a new range of 10 UNIX-based systems, including the DPX 1000, 2000, 3000 and 5000, all developed in France. Moreover, early in 1989, Bull became the world's first vendor to be licensed to use the X/Open brand for its SPIX version of UNIX System V.3.

Lower down the processor scale, the company expanded its family of Questar workstations and introduced an OS/2 micro, the Micral 75. Sales of both product lines showed exceptional growth during the year.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS



Proprietary systems drove up profits for some companies, such as Apple. Others, however, abandoned their closed systems in favor of open platforms.

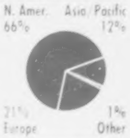


12

Total DP Revenues 4,434.1

APPLE COMPUTER INC.

20525 Mariani Avenue
Cupertino, CA 95014
(408) 996-1010



A huge jump in revenues and profits didn't mean a year without drama for Apple Computer Inc. A two-part corporate restructuring led to the departure of several key corporate executives, but Apple mitigated the effect of these desertions by hiring several former IBMers. Also making news were important corporate agreements. But banner headlines awaited in early 1989: Apple shocked the industry when it announced that earnings for the first quarter of the new year would fall due to miscalculations in pricing and purchasing.

The wounded earnings were especially startling because they followed a year of tremendous financials. For the calendar year, Apple sales amounted to more than $4.43 billion, an amazing 45.8% jump from the $3 billion reported the year earlier. Net income also leaped to $419.3 million, up nearly 50% over the $280.5 million earned in 1987. International sales continued to inch upward and accounted for 33% of revenues in 1988 compared with 28% in 1987.

Apple hurt itself when it overreacted to rising costs and purchased significant amounts of 1 megabyte DRAMs. In September, to offset these higher component costs, it raised some prices. That lead to an unanticipated change in the sales mix, which shifted to less profitable stripped down systems. In January 1989, Apple retreated, lowering prices and making certain budget cuts such as limiting hiring. Still, Apple chairman John Sculley says he still expects revenues to increase 30% or more in 1989.

Aiming at its next goal of a $10 billion year in revenues, targeted for 1993, Apple reorganized twice. In April, it split into three marketing/sales groups by breaking out Asia, Europe and the United States. In August, the company then split into four independent operating divisions: Apple Products, Apple USA, Apple Europe and Apple Pacific. The big loser in the shuffling was chief operating officer Del Yocam, who lost his title and was named head of Apple Pacific. Yocam announced his retirement.

While the organizational moves were made to prepare Apple for the 1990s, unquestionably the star for some time to come will be the Macintosh computer. In September, Apple introduced the Macintosh IIx, the first Mac to use the 68030 chip and provide a 3½-inch floppy disk that can read and write to both MS-DOS and Apple II formats. This product was followed in January 1989 by the more compact Macintosh SE/30. What still hasn't appeared, though, is the much-delayed Macintosh laptop.

Apple continued to work on its networking alliance with Digital, announcing that Digital's field service staff would service Macs. The company also unveiled VAR relationships with Texas Instruments Inc. and Tandem Computers Inc. and continued its small streak of acquisitions by buying Network Innovations Corp. and Orion Network Systems Inc.

MICRO
2,950

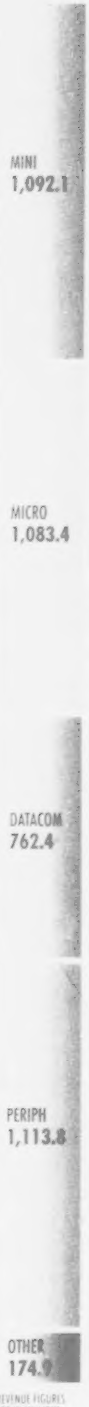
PERIPH
1,350

SOFTWARE
134.1

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

Big Yen for Small Computers

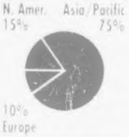
Toshiba overcomes trade sanctions and maintains its world laptop lead.



REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

13
Total DP Revenues
4,226.6

TOSHIBA CORP.
1-1 Shibauar 1-chome
Minato-ku, Tokyo 105, Japan
(81-3)-457-3275



Toshiba Corp. cracked a two-year-long slump, as corporate revenues last year rose 7% to ¥3.7 trillion ($28.8 billion). Brisk demand for semiconductors and portable computers contributed to the corporate revenue gains. Moreover, the company's strong earnings showed that Toshiba was more successful than many other Japanese electronics firms in coping with the strong yen. Net income outpaced the modest sales gains, rising a sharp 81%. IS revenues, which make up less than 15% of the company's total business, climbed 9% to ¥541.6 billion ($4.2 billion) on the continued strength of Toshiba's booming personal computer business.

Toshiba dominates the laptop PC market, having captured an estimated 50% of the Japanese market, 45% of the European market and 25% of the U.S. market. This market dominance shows that the stigma of Toshiba's violation of the Coordinating Committee for Multilateral Export Controls' (COCOM's) trade sanctions is fading. The incident, in which sophisticated numerically controlled machine tools were shipped to the Soviet Union in violation of COCOM rules, injured the company's reputation and cut into its U.S. sales.

Kunika Mizushima, Toshiba's IS chief

Toshiba has benefited from growing portable PC and laptop sales both in terms of revenues and increased international visibility. Revenues from the laptop and portable lines rose 30% last year, and some analysts estimate that growth will continue in 1989. The laptops helped boost sales of microcomputers. Revenues there climbed a robust 20% to ¥138.8 billion ($1.1 billion). Among other systems division operations, minicomputer sales rose in its domestic Japanese markets. Buoyed by strong international sales of printers, peripherals equipment sales showed a 13% increase, reaching ¥142.7 billion ($1.1 billion). Toshiba acknowledged that its results in telecommunications (a market in which it is a relatively new player) and in the highly competitive plain-paper copier market were below its other product lines.

Determined to expand its laptop and portable computer business even further, Toshiba introduced two portable computers in 1988 to the European and U.S. markets. The 32-bit T5200, the most powerful Toshiba portable computer to date, is based on Intel Corp.'s 20 megahertz iAPX 80386 microprocessor. Because the new T5200 is a portable rather than a laptop computer, it can't run on batteries and must be plugged into an electrical outlet. The computer supports local area network applications and is light enough to be transported between office locations, which positions the computer well for those office environments where flexibility and security are requirements. The battery-powered T1600 has a 12MHz Intel 80C286 microprocessor, a backlit liquid crystal display (LCD) screen and a lifetime battery. In addition to its domestic manufacturing sites, Toshiba builds laptops at an Irvine, Calif., facility and intends to begin production next April at a West German plant now under construction.

Recently, the company has tried to broaden its semiconductor operations in order to reduce its current reliance on memory components. Last year, it established a semiconductor joint venture with Motorola Inc. and, more recently, agreed to share its application specific integrated circuit (ASIC) design technology with Siemens AG of West Germany.

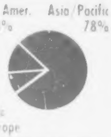
Among significant product efforts this year, the company disclosed that it is developing a 14-inch LCD, the largest of its kind, in conjunction with researchers at IBM Japan's Yamato Laboratory. Prototypes, developed over a two-year period, include monochrome and color versions.

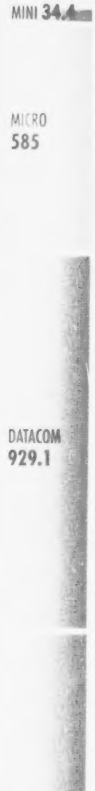
In addition Toshiba researchers independently developed an ISDN videophone capable of transmitting moving color images. The company also unveiled a 4 megabyte 3½-inch floppy disk drive.

14
Total DP Revenues 3,441

MATSUSHITA ELECTRIC INDUSTRIAL CO. LTD.

1006 Kadoma, Osaka 571, Japan
(81-6)-908-1121





Matsushita Electric Industrial Co. Ltd.'s small IS operations continued to outpace the company's mainstay consumer electronics business. IS revenues climbed 16% to ¥441 billion ($3.4 billion), even as overall revenues rose only 13% to ¥5.2 trillion ($40.7 billion).

Net income increased 29%—less than that of other Japanese firms—suggesting that Matsushita's efforts to deal with the appreciated yen were not as successful as had been hoped. Nevertheless, international sales were strong, and the company is working toward parity in the ratio of exports to overseas production. With about 11% of sales coming from non-Japanese production plants, Matsushita still has a long way to go. In 1988, overseas production reached ¥570 billion ($4.4 billion), up from ¥425 billion ($2.9 billion) in 1987.

Four years ago, Matsushita began a program designed to decrease its reliance on consumer electronics operations. It placed special emphasis on office automation, factory automation, audiovisual equipment and semiconductors. These product areas now account for 17% of total sales, up from 7% in 1982.

In office automation, Matsushita focuses on the growing demand for home office products, which now include telephones, facsimile machines, personal computers, copiers and word processors. Matsushita also develops 32-bit workstations, and future operations will take the company into software, systems and networks.

To cope with the highly competitive Japanese business environment—made more difficult by the strong yen and trade friction—Matsushita took three steps in 1988. The company unified the fiscal periods of its group companies; reorganized its domestic sales organization by class of customer (households, government and corporate) and, in April, concluded a merger with Matsushita Electric Trading Co. Ltd. This merger unifies overseas manufacturing and sales functions while combining domestic and overseas operations.

Overall, Matsushita sees globalization as the key to transforming itself from Japan's largest consumer products company to a worldwide force in all types of electronics. At the close of 1988, Matsushita had 100 overseas locations—66 manufacturing and 30 sales companies plus four financial subsidiaries—in 38 countries employing more than 50,000 people.

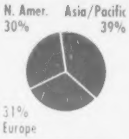
Matsushita's North American Television Division, established in April, is the company's first localized integrated overseas operation. The division develops, manufactures and sells TVs for the North American market from its base in Illinois. In Europe, the firm already is assembling mobile telephones and electronic components in the United Kingdom, while continuing to increase locally made components.

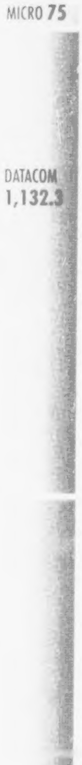
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

15
Total DP Revenues 3;391.6

CANON INC.

P.O. Box 5050
Shinjuku Dai-ichi
Seimei Building
Tokyo 163, Japan
(81-3)-348-2121





Canon displayed a picture perfect year: the firm set sales and income records, as office copier, laser printer and facsimile machine sales rose. Revenues climbed 13.3% to over ¥1.1 trillion ($8.6 billion), and income soared 180% to ¥37.1 billion ($289.5 million). IS and related product sales, which include personal computers, laser printers and facsimile machines, rose a strong 27% to ¥434.6 billion ($3.4 billion).

Canon took steps to continue that growth in the face of continued high exchange rates. A four-year effort to remake Canon into a global business force began in 1988. The company's plan—like those of many other Japanese companies—calls for locating manufacturing and research centers outside its home market. Early examples of the plan are already evident. In the United States, Canon Virginia Inc. began full-scale copier production early in the year and subsequently turned to laser printer production.

Canon expects to shift much of the development and production work for electronic typewriters to the United States. Moreover, the company's first technology development center in Britain was opened last year. The center, called Canon Research Center Europe Ltd., is working on computer software development, intelligent office machine interfaces and a new workstation computer language.

Canon is known largely for its laser printers. Sales of the printers again rose in the important U.S. export market, as well as in Japan. In addition, orders increased for newer technology printers, including the BJ-130 bubble-jet printer, which prints high-quality characters at 220 characters per second on plain paper.

Sales of Canon's facsimile machines in North American markets reached record levels in 1988. The company reported strong demand in Europe, where Canon has established a small but rapidly growing presence. The sales gains were aided by a series of new products.

Among these were the FAX-120, a multifunction telephone and facsimile machine that garnered a strong share of the North American market. New high-end models include the FAX-450, with features such as high-speed transmission and precise tonal gradation; the FAX-705/750, with single-operation broadcasting to as many as 173 locations; and the L6500, which accommodates both CCITT Group 3 and Group 4 standards, in anticipation of the Integrated Services Digital Network (ISDN).

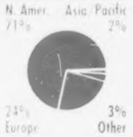
In peripherals, a joint agreement with workstation vendor NeXT Inc. provided the year's highlight. The company's peripherals business received a boost in October, when NeXT, the company launched by former Apple Computer Inc. cofounder Steve Jobs, introduced a computer incorporating Canon's erasable magneto-optical disk drive.

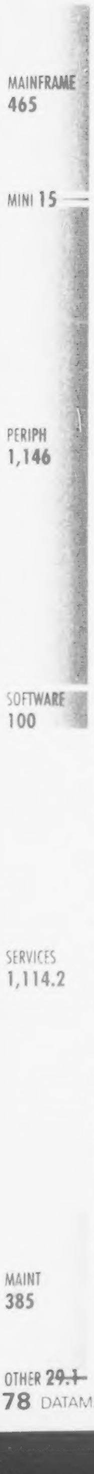
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

16
Total DP Revenues
3,254.3

CONTROL DATA CORP.

8100 34th Avenue South
Minneapolis, MN 55420
(612)-853-8100





Control Data's logo might be more symbolic of the company's current status if it were a question mark. Thirty years into a history that often saw the company playing near the summit of the industry, CDC had hoped that 1988 would mark the turnaround in its five-year struggle to remedy its financial woes. Having suffered losses in 1985 and 1986 that totaled $832 million, CDC returned to modest profitability in 1987. But it was unable to sustain that momentum and closed out 1988 with only a slim profit of $1.7 million—a margin of less than .1% on revenues of $3.6 billion.

Having failed to cure its operational troubles, CDC announced in mid-April 1989 that it would totally reorganize its operations, slashing 3,100 jobs—about 10% of its work force—abandoning the supercomputer arena entirely and cutting back its traditional mainframe operations. The company says the reshaping will cost about half a billion dollars and will shift the company's emphasis to ventures like subsidiaries Micrognosis Inc. and its Energy Management Systems Division. Rumors flew that chief executive Robert Price could not survive.

Reorganization is not new at CDC, and accounted for much of the news in 1988. Lawrence Perlman, given credit for turning around CDC's money-losing disk business, was named president and chief operating officer in December. One of his first moves as president was to reinstall Carl Ledbetter as president and chief executive officer of ETA Systems. It proved to be a short assignment.

Last summer, CDC spun off its still profitable disk operations as a separate subsidiary, Imprimis Technology Inc., supposedly in the hopes of attracting a buyer. Plans to sell the disk unit were put on hold, however, when investor enthusiasm for the competitive disk drive industry cooled. However, if CDC is compelled to sell the division, it loses its reliable supplier of both revenues and profits.

Product news out of CDC was minimal in 1988; the company was the only mainframe vendor not to announce a new large system last year. CDC did announce a midrange Cyber 960 in April 1988; delays with logic chips pushed delivery of that system into 1989.

CDC no longer packs enough weight in the computer industry to sell products based on a proprietary operating system. Its move to support UNIX last year may have come too late; by year's end, CDC still had not begun to ship UNIX-compatible machines.

CDC's VTC chip-making unit is also believed to be a candidate for disposal. Last year, VTC suffered delays in production of high-performance integrated chips and was said to have lost about $25 million.

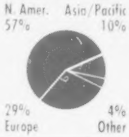
Perlman has also taken on the job of managing CDC's computer business, replacing Thomas Roberts, who resigned from his job as president of the Computer Systems Group in December.

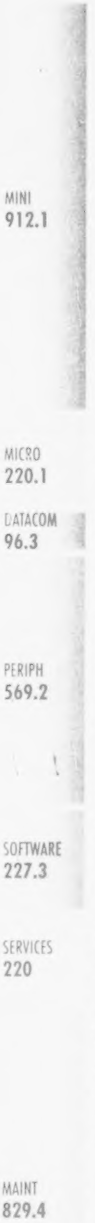
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

17
Total DP Revenues
3,074.4

WANG LABORATORIES INC.

1 Industrial Avenue
Lowell, MA 01851
(508)-459-5000





The financial turnaround that Wang Laboratories Inc. had seemed to achieve in 1987 proved short lived, as revenues stalled at $3 billion and profits tumbled 47% to $50.1 million. The downturn reflected an inability to lure new customers to Wang's VS computer family and cast a cloud over Wang's long-term outlook.

Even as midrange vendors in similar straits fled to the relative safety of niche applications or emerging UNIX markets, Wang clung tightly to its VS computer and office systems focus. Enhancements to the 32-bit VS computer line, designed to handle data, text, voice and image processing, positioned the product once again as the linchpin in Wang's future. Yet, the line was less of a lure than in years gone by.

Wang's efforts to attract new customers took several forms. For one, the company moved to lower entry-level prices by incorporating the VS instruction set in a microprocessor. The new 5000 series computers were priced to counter Digital's MicroVAX 3000 series and IBM's AS/400.

Lowering entry costs was a tactic employed elsewhere in the company. Much of the year's efforts in imaging systems, voice message services and PC local area networks, for instance, focused on low-cost packages or trial products. Wang launched nine prepackaged imaging applications for those unwilling to spend development dollars on the technology. A series of add-on boards and software to turn a PC into an integrated voice and imaging system, and free pilot trials of its voice services, also appeared. Freestyle, a PC-based system that joins image and voice applications in an à la carte fashion, continued the low-priced caravan.

Despite some 2,200 orders for the new VS 5000 series, there was little to suggest the series has appeal outside Wang's traditional customer base. A dual processor VS 7320 that began shipping early in the year and provided the company's high end similarly failed to widen customer ranks.

The focus on introductory imaging applications, and the microprocessor implementation of VS, highlights Wang's determination to make the operating system the cornerstone of an integrated voice-, data- and image-processing environment. Gloomy financial results, however, brought this strategy into serious question. Barring a major price breakthrough with the VS, or a significant reshuffling of the PC and networking markets, Wang's efforts are unlikely to return the company to the ranks of the industry's fastest growing.

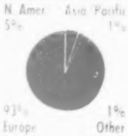
One bright sign was Wang's continued strong performance outside the United States. Bolstered by a weak U.S. dollar, sales outside the company's home market rose to 43% of total revenues. Moreover, the 8.5% sales increase in offshore revenues occurred despite a manufacturing problem in Europe that crimped VS computer sales in the fourth quarter.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

18
Total DP Revenues
3,044.9

NIXDORF COMPUTER AG

Furstenalle 7
4790 Paderborn
West Germany
(49-5251)-150



MAINFRAME	131.1
MINI	484.1
MICRO	205
DATACOM	178.9
PERIPH	1,280.3
SOFTWARE	418.6
SERV	33.7
MAINT	313.2

West Germany's once bright star, Nixdorf Computer AG, lost its luster last year. The company managed to raise revenues 5.4% to DM5.35 billion ($3 billion), but this was only a fraction of the growth achieved in previous years. Worse than a revenue slowdown, however, was the fact that Nixdorf's core business showed a loss of DM59.8 million ($34 million) over the year. Only by selling off property did the company show a profit at all.

These adverse conditions forced Nixdorf to cut its dividend for the first time since the company went public in 1984. Nixdorf chairman Klaus Luft admitted last summer that the company probably would not return to its 1987 dividend levels until the early 1990s. Then he embarked on a course to cut losses, restructure divisions and rethink strategies.

Nixdorf reduced its staff growth in 1988 until a planned 10% rise fell to 5% by the year's end. The company also canceled a number of nonessential projects and sold off estate properties. The company said these moves would help secure its financial future and strengthen its market position.

The company held on to much of its business in the traditional markets of banking and retail, saw PC sales rise and orders for its UNIX lines begin to flow. Telecommunications products performed well, and by the end of the year over 7,700 of the firm's ISDN 8818 digital PBXs had been installed worldwide. A major order from the West German Federal Labor Office helped, as did the addition of the PBX to the product catalogue of the Italian telephone authority SIP. The strongest sectors, however, were services and micros, both of which saw strong growth.

Money from rental agreements fell by 20%, however, and the company's aggressive plans to penetrate the computer-integrated manufacturing (CIM) sector failed to bring the desired results.

Much of Nixdorf's research and development spending was focused on the development of a three-pillar product strategy: proprietary operating systems and software, UNIX-based open systems and PCs with standard software. Migration and interfacing packages are now emerging from the company to allow customers to build their own mix of systems from these three pillars. Nixdorf has supported the open systems cause in public, and this strategy represents a major effort to put its products where its mouth has been. The Targon UNIX-based computer family has been its most open product in the past. The range was extended, and the Targon PC now supports UNIX, MS-DOS and OS/2.

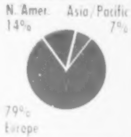
With its margins still being squeezed, Nixdorf now plans further cutbacks—particularly on staff levels, which are likely to fail by 1,600 by the end of the year. But with European competition getting fiercer, it may take much more than that to get the the relatively flat growth in revenues.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

19
Total DP Revenues
2,794.6

NV PHILIPS GL

5621 BA Eindhoven
The Netherlands
(31-40)-79111



MINI	414.8
MICRO	308.5
DATACOM	460.3
PERIPH	902.9
SOFTWARE	184.6
MAINT	417.3
OTHER	106.2

These days, the buzz words at NV Philips GL are "core business sectors:" Four core businesses have been identified: the traditional lighting sector, components technology, consumer electronics and information technology and communications.

These core businesses produced total company revenues of F56.1 billion ($28.4 billion), but growth is slow—only a modest 6.4% increase. In the information technology sector, the Telecommunication and Data Systems Division's Business Systems Group produced F5.5 billion ($2.8 billion) in IS revenues, again a modest increase over 1987 of 5%.

During 1988, microcomputer sales increased by more than 50%, and the company hopes that the trend will continue this year. There were modest increases in the revenues from minicomputers, software, peripherals and maintenance. But data communications sales dropped by more than 10%, which augers ill for a company so heavily oriented toward communications.

Office systems, PCs, minicomputers, optical filing systems, PBXs and networking products are all part of what the company calls its "sophomation concept," which aspires to provide interconnectivity and open systems standards in these products lines.

Two products stand out: the Megadoc optical storage system and the Maestro software engineering environment developed by Softlab, a West German software house. Megadoc is one of the most successful large optical storage systems on the market. Around 100 systems are now installed, primarily in the government, banking and insurance sectors.

The Maestro product is touted as being among the first computer-aided software engineering (CASE) type products on the market. In its first days it was called a clever 4GL.. But it has been very successful and has recently had a midlife boost with the launch of Maestro II designed to run under UNIX and support the emerging open systems standards. That's going to be no guarantee of survival, though. The increasing number of CASE tools hitting the market are rapidly leaving its functionality behind.

The company boosted its commitments to open systems throughout last year. It became one of the founding members of the Open Software Foundation and won some major deals for its UNIX-based P9000 systems, one from the U.K.'s Inland Revenue worth $3.6 million.

The company also strengthened its expertise in more specialized sectors last year, such as computer-aided engineering (CAE). In partnership with Silvar Lisco Inc., Philips is helping to develop specific engineering software for its own factories and for the U.S. company to market. The two companies are already partners in a research and development consortium covering CAE systems backed by the European Commission's ESPRIT research program.

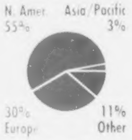
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

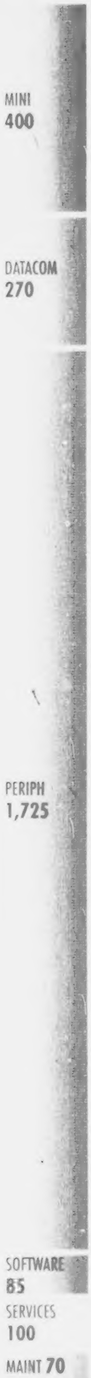
20

Total DP Revenues
2,650

XEROX CORP.

P.O. Box 1600
Stamford, CT 06904
(203)-329-8700





Xerox Corp. is celebrating its 20th year in the computer business in 1989, but you won't hear any brass bands. Try as it might, Xerox has never quite hit the right note in computers. Its mainframe and PC efforts went nowhere. The technology developed at its vaunted Palo Alto Research Center made plenty of money for other people—Adobe Systems Inc., Apple Computer Inc., Grid Systems Corp. and 3Com Corp. to name just a few—but never much for Xerox. When its mainstay copier business came under attack by the Japanese, Xerox sought shelter in financial services, the source of nearly half of its profits in recent years.

So Xerox's announcement in January of another strategic reorganization was an old song. Only this time Xerox may be singing for its life. This one-time glamour stock is widely regarded as a takeover target. If Xerox managers can't put their house in order, a raider might do it for them, selling off the profitable financial services part of the business—with a book value of some $3 billion—and dining out on the cash flow from the copier business.

Thus the reorganization: closing down the unprofitable medical-imaging business, scaling back in electronic typewriters, cutting 2,000 jobs, overhauling the marketing of its document-processing systems. The restructuring required a $275 million pretax write-off that reduced profits by nearly a third to $388 million, down from $578 million in 1987. Total revenues rose 8.8% to $16.44 billion. DATAMATION estimates that sales of information technology products, such as workstations, printers, desktop publishing software, facsimile machines and communications networks amounted to $2.65 billion in 1988, a 9.7% increase over 1987.

Xerox has labored to refocus its information technology efforts toward document processing. Its Ventura desktop publishing software for PCs, which it upgraded in 1988, is a hit. And Xerox is betting that FormBase, a new program for creating and publishing business forms, may be even bigger.

Efforts to sell full-blown document-processing systems using Xerox hardware have foundered because of Xerox's proprietary architecture. In 1987, Xerox announced it would adopt an open standard and move its systems to the Sun Microsystems SPARC microprocessor and the Sun/AT&T UNIX.

Xerox's latest reorganization changed the way the company plans to market these systems. Building on its success in selling custom systems to the government, Xerox wants to do the same for large customers in a handful of commercial markets—financial services, pharmaceuticals and aerospace, to name three big ones. A new marketing organization, Integrated Systems Operations, headed by Jay H. Nussbaum, former vice president of the Custom Systems Division, will handle sales to both the government and commercial markets.

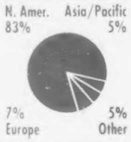
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

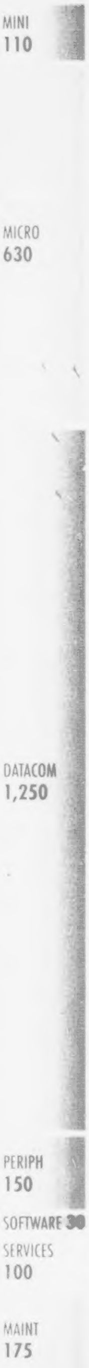
21

Total DP Revenues
2,445

AT&T

550 Madison Avenue
New York, NY 10022
(212)-605-5500





In 1988, its fifth post-divestiture operating year, AT&T cleaned house. It wasn't cheap. In December, the monolith took a $6.7 billion charge against earnings to speed its conversion to an all-digital network, and the company posted its first annual loss in 104 years. The move followed a year of good business. AT&T's revenue was the highest since divestiture, despite continued, though narrowing, losses from computer operations.

Entering 1989, AT&T undertook a major corporate reorganization in which it broke into 19 business units and 24 divisions. The company says the restructuring will give line executives more responsibility, boosting their ability to succeed.

Still, AT&T has not quieted critics who doubt its ability to escape from old, noncompetitive attitudes. AT&T answers this criticism by continuing the not-so-fine-tuning that began with divestiture. Last summer that meant a hiring freeze and the initial redeployment of nearly 2,000 administrative and staff employees to front-line sales positions. Streamlining continues into 1989, and word has it that AT&T will attempt to curtail expenses by up to 10%. But cost-cutting is only part of AT&T's strategy.

The company's decision to take the $6.7 billion charge for network digitization was a response to the loss of domestic long-distance business to rivals MCI Communications Corp. and U.S. Sprint Telephone Co. By the end of 1990, all of AT&T's domestic switched traffic will be carried digitally, as will all private-line facilities by the end of 1992.

Without this latest one-time charge, AT&T would have recorded its best post-divestiture year ever. Total operating revenue was $35.2 billion, up from the restated 1987 figures of $33.8 billion. The company reported a net loss of $1.7 billion, versus the $2 billion net profit earned the previous year.

AT&T continues to bleed in the computer business. Analysts believe that it lost roughly $300 million in 1988 and will lose another $150 million in 1989. DATAMATION estimates AT&T's information technology sales—including PCs, 3B minicomputers, terminals, modems and digital PBXs—to be $2.4 billion, up 22.3% over 1987's levels. Nearly half of the growth stemmed from the acquisition of Paradyne Corp., a Largo, Fla.-based modem maker.

Some of the liveliest moments of the year emerged from the UNIX community. AT&T prompted a whirlwind of activity when it decided to purchase up to 20% of Sun Microsystems Inc. during the next three years. Fearful of a powerhouse UNIX monopoly, a group from the Who's Who of the computer industry created the Open Systems Foundation to develop products around IBM's version of UNIX. AT&T and more than 30 allies then formed UNIX International Inc. The two sides continue to fight it out, each declaring its version of UNIX to be the standard.

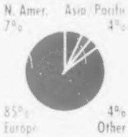
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

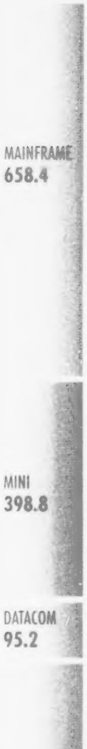
22

Total DP Revenues
2,425.1

STC PLC

10 Maltravers Street
London WC2R 3HA, England
(44-1)-836-8055





STC PLC's 14% rise in revenues for 1988 far outstrips the performance of its IS division, ICL, which saw revenues move by only 5% to £1.4 billion ($2.4 billion). Mainframe orders were slack until new models were released in late summer. The good news was that margins improved over the year from 8.5 to 9.5%, and profits were up by 16%.

The British company had a busy year with acquisitions. In February, STC bought Northern Telecom Ltd.'s DP and communications operations in Europe for £35 million ($62.3 million). In September, the company acquired IS supplier Regnecentralen in Denmark, at a cost of £6 million ($10.7 million).

In December, STC opened its checkbook on the other side of the Atlantic, buying intelligent networks and workstation company Computer Consoles Inc. for $168 million. The same month, it took control of Datachecker Systems Inc., a supplier of electronic point-of-sale systems, for $90 million.

Back at home, it was also a year of cost cutting. ICL managed to reduce inventory from its 1984 level of $390 million to $245 million in 1988. The division now turns over inventory four times a year, and the target is six times a year—saving another $53 million between now and the end of 1990.

On the product side, the company fears the tightening margins that standards and open systems will bring and is focusing much of its activities on building up its software and services operations. Even so, sales of its UNIX-based departmental systems doubled, and the company picked up a new product—the RC 9000 fault-tolerant UNIX system—through its acquisition of Regnecentralen.

In August, ICL added a new multinodal version of its series 39 mainframes. Called the extended performance (XP) processor series, the new system offers a claimed 35% increase in price performance and a doubling of memory to 32 megabytes. ICL's fast-search system—the Content Addressable File Store—is standard in that system. The range consists of three new entry-level systems (15XP, 25XP and 35XP), two dyadic processors (25DXP and 35DXP) and one two-node system (35XP2).

The company is looking to foreign markets for much of its growth this year, particularly the United States, where the ICL Datachecker operation ranks among the world's top three in-store retail systems suppliers. The company also reports sales to the Eastern Bloc to be growing since the relaxation of Western export trading rules.

But one international problem that just won't go away is the controversy over ICL's involvement in South Africa. An internal ICL memo surfaced last year revealing that the company was still maintaining control of its South African operations—despite the company's apparent withdrawal from the market—and that employees should be informed of this involvement only on a need-to-know basis.

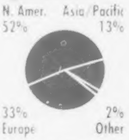
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

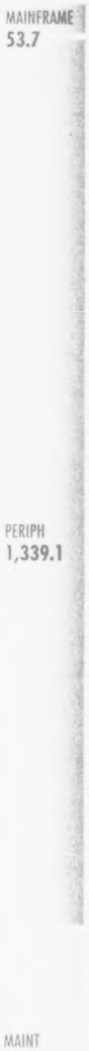
23

Total DP Revenues
2,078.5

MEMOREX TELEX NV

Hoogoorddreef 9
1101 BA Amsterdam ZO
The Netherlands
(31-20)-97-4331





Business lingo will never be the same again. The machine in the corner of the office that taps and clatters away with reassuring regularity may now become known as a "Memorex Telex." The extra syllables come from the January 31, 1988 merger of Telex Corporation and Memorex International, the company formed in late 1986 after breaking away from Unisys.

Headquartered in Amsterdam, Memorex Telex began life with more than 1,300 staff, operations in 26 countries and distributor links in 50 others. It claims to be the world's largest supplier of plug-compatible computer equipment and accessories.

During 1988, revenues for the merged company rose more than 100% from combined sales of around F2.1 billion ($1 billion) in 1987 to a consolidated total of F4.2 billion ($2.2 billion). IS revenues, primarily sales of computer peripherals, accounted for over 90% of that total.

Memorex Telex's product spread encompasses computer supplies; 3270-compatible systems especially for the airline, travel and communications industries; large systems and departmental peripherals and networking and telecommunications equipment.

In December, the company extended its involvement in the networking sector by becoming a founding member of the Open Token Foundation, created to promote interoperability between token ring products based on the IEEE 802.5 and the Fiber Distributed Data Interface standards.

In the first major marketing move since the merger, Memorex Telex set up a new PC organization earlier this year. Called Intelligent Systems (ISYS), it is run by former Telex U.K. chief Richard Slogrove and is based in Tulsa, Okla. Product planning and engineering is based in Milpitas, Calif.

ISYS' first products are safe and proven. Grouped under the series 7000 banner, they include Intel processor-based MS-DOS PCs incorporating the standard 8088, 80286 and 80386 chips; communications products; extra storage and displays; a range of printers, including laser printers, and a variety of standard software. By the end of November 1989, the company expects revenues from ISYS to hit $150 million, and to double a year after that. In the PC business, distribution is the key to success and, with Memorex Telex's combined networks of subsidiaries and distributors, the company stands a good chance of coming close to its targets.

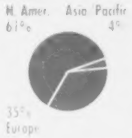
The company is also trying to grow by acquisitions, but with little success so far. It made a bid for the plug-compatible mainframe company National Advanced Systems Corp. but was outflanked by Hitachi Corp. and GM's Electronic Data Systems Corp. The company is still looking for targets though, particularly in the mainframe peripherals market.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

24
Total DP Revenues 2,065.6

COMPAQ COMPUTER CORP.

20555 State Highway 249
Houston, TX 77070
(713) 370-0670



MICRO
2,065.6

As it seems to do every year, COMPAQ Computer Corp. broke another record in 1988, becoming the first company to reach $2 billion in sales in only five years of existence. In doing so, Compaq held tight to its title as the top supplier of IBM-compatible PCs to corporate America. The company's 1988 sales rose by 69.7% over 1987 figures, rising to $2.07 billion from $1.22 billion.

In the midst of this happy news, Compaq continued to release new models based on the latest Intel Corp. technology. As has become the standard operating procedure in the PC world, Compaq beat IBM out of the box with a PC based on Intel's new 80386sx chip. Last year, Compaq introduced its long-awaited laptop. The computer combined battery-powered 80286 technology with new power conservation features and flat-panel video graphics technology. With Dataquest Inc. predicting a $3.2 billion market for laptops by 1990, Compaq was anxious to have a product to offer its business users.

In May, Compaq and Digital Equipment Corp. announced a technology exchange agreement to ensure connectivity of their products. Though not a breakthrough for the company, it reemphasized Compaq's role as a major player in the corporate computing world.

While there was little out of the ordinary in these announcements, the company did deliver one shocker: the Extended Industry Standard Architecture (EISA) consortium. In September, Compaq joined 70 other PC vendors to announce the EISA consortium, which promised to offer an alternative to the IBM-designated MicroChannel Architecture-based PCs. No one company has taken the lead in the consortium, but Compaq has the most to gain, or lose, from the success of the group.

Girding itself for battle, Compaq fielded a vocal proponent of EISA: Joseph R. Canion, president and chief executive officer of the company, who traveled the country in support of EISA.

No machines bearing EISA will be available until late 1989, so the real battle between the two competing architectures is a ways off. Still, the seriousness of the battle was indicated in an early skirmish between Compaq and Businessland Inc. In February 1989, Compaq severed its six-year relationship with the San Jose, Calif.-based computer retail chain, citing a disagreement with the chain over its emphasis on sales of IBM's MicroChannel-based PS/2 personal computers.

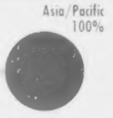
Despite the potential for trouble inherent in its EISA strategy, Compaq has been selling all the machines it can manufacture and continues to increase its sales overseas, as well. In 1988, 40% of the company's revenues were earned outside the United States, will the largest portion coming from Europe. According to Dataquest, Compaq is the fourth-leading supplier of PCs in Europe.

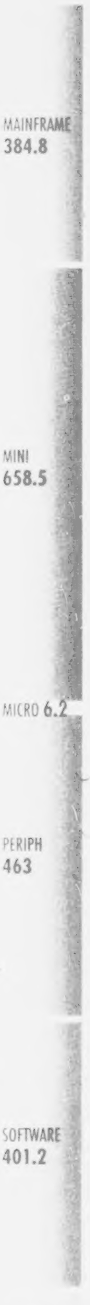
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

25
Total DP Revenues 2,057.7

NIHON UNISYS LTD.

17-51 Akasaka, 2-chome
Minato-ku, Tokyo 107, Japan
(81-3) 585-4111





On April 1, 1988, the public company Nippon Univac Kaisha Ltd. (NUK) merged with the wholly owned subsidiary of Burroughs Co. Ltd. in a move engineered by NUK, Unisys Corp. and Mitsui & Co. Ltd. The resulting company, Nihon Unisys Ltd., immediately became the fifth-largest computer company in Japan. One-third of it is owned by Unisys, one-third by Mitsui and one-third is traded on the Tokyo Stock Exchange, with capital participation by Oki Electric Industry Co. Ltd. and Mitsubishi Electric Corp.

By adding Burroughs' small and medium-sized systems, the move balanced out Nippon Univac's product offerings, which had been dominated by large computers. It also increased the user base and potential user base for both companies. Geographically, the companies were complementary, with Nippon Univac in the large cities and Burroughs in localities. The company says its Japanese customers' needs now are more precisely reflected in the worldwide Unisys development program and, more important, the company can now be a systems integrator.

As a product supplier, Nihon Unisys manufactures 10% of its hardware, imports 40% from the United States and obtains 50% from other Japanese vendors. Ninety percent of operating system software is developed in the United States, 10% by Nihon Unisys. Conversely, 90% of applications software is developed by Nihon Unisys and its affiliates, with 10% coming from the United States.

Rising profits offset associated internal reoganization costs. Revenues increased 40.8% to ¥263.7 billion ($2.1 billion) in 1988, led by demand for the firm's medium-sized and large computers. Net income rose 20.9% to ¥3.5 billion ($27.5 million).

Major product announcements over the last year span the firm's entire product line. They include 32- and 16-bit SB8/28 workstations; a 32-bit SS-7 engineering workstation; the KS-303 AI workstation; the PW family of workstations for OS/2, MS-DOS and AX (Japan's version of MS-DOS) operating systems; the S500J high-speed document-encoding system; the DP1000 high-speed MICR reader-sorter; the AGS500 graphic display system; the Link family of hybrid multiplexers; the Series 8 office computer; U5000/85 and U6000 UNIX processors; the A4/A6-FX 400 advanced medium-scale general purpose computer; the A12-1 large-scale general purpose computer; the 2200/600 high-end large-scale general purpose computer and Open Systems Interconnection software for mainframes.

Perhaps the firm's most significant announcement was the Micro-A, ambitiously billed as the world's first desktop mainframe. Housed inside a Unisys PW/2 series 800 PC, the Micro-A uses a semiconductor and packaging technology called SCAMP (Single Chip A-Series Mainframe Processor).

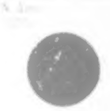
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

26

Total DP Revenues 1,965

TRW INC.

1900 Richmond Road
Cleveland, OH 44124
(216) 291-7000



While TRW Inc.'s overall information systems and services revenues were flat for 1988, the reputation the company achieved over the same period for building large-scale, image-based information-processing systems began to bear fruit at the end of the year. Boosting investment in new products for its fledgling image-based data-processing group, Information Systems Engineering Equipment and Services (ISEES), paid off, and the momentum increased in 1989.

An example of the kinds of image-processing contracts TRW won in 1988 is a $5 million contract from the U.S. Postal Service. TRW will provide and test an image-processing system capable of handling 90,000 pieces of mail per hour, assigning nine-digit zip codes to mail not readable by machine.

Despite its success in image-processing, business in the Electronic Equipment Maintenance (EEM) group—the third-party maintenance business unit that includes ISEES—was down 11% to about $160 million. Pared down product lines among the major computer vendors were responsible for that blemish on TRW's 1988 balance sheet. In doing third-party maintenance contracts for IBM and Xerox Corp., among others, TRW normally acquires parts from computer makers' discontinued product lines. In 1988, many companies were not offering as many models, so the amount of old or outdated equipment available was down considerably. Consequently, the company says, it could not respond to service calls as quickly as it might have hoped.

SERVICES
1,805

The maintenance business may have suffered further because of the company's decision, for the second half of 1988, to divert funds from the purchase of spare parts to new product development.

All in all, business was basically flat, with 1988 revenues at $1.97 billion in the conglomerate's Information Systems sector, which includes the business units EEM, TRW Credit Information Services and Real Estate Information and Services.

In the first quarter of 1989, the third-party maintenance business continued to be flat, but particularly strong performances were registered from the consumer credit-reporting and image-processing businesses. First-quarter sales of the Information Systems sector were $141 million, a 12% increase over the 1988 first-quarter figure of $126 million.

The separate Space and Defense sector, which handles military and space-related information systems, was TRW's top scorer in 1988. TRW reports that it benefited from Strategic Defense Initiative contracts, under which TRW develops artificial intelligence and command-and-control systems. One example was a $20 million one-year contract won by TRW's Federal Systems group in Washington, D.C., to provide an interactive, bilingual command-and-control information system for about 400 workstations and graphics terminals for the U.S. Army.

MAINT
160

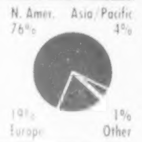
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

27

Total DP Revenues 1,907.6

ELECTRONIC DATA SYSTEMS CORP.

7171 Forest Lane
Dallas, TX 75230
(214) 661-6000



Electronic Data Systems Corp.'s apparently unending legal skirmishes with founder Ross Perot did not keep General Motors Corp.'s IS superpower from setting yet another record for revenues, net income and earnings per share. The best news was that non-GM revenue soared 32.4%, from $1.44 billion to $1.90 billion. (IS revenues in the DATAMATION 100 do not include revenues from sales by one unit of a company to another.) Combined with a slight drop in GM's own contribution to EDS' overall health—from $2.88 billion to $2.84 billion—EDS' "base business," as the company calls any deal done outside the GM womb, rose from 33% of its overall revenue to 39%. That was just about the split EDS had hoped to achieve.

"The growth in our base business was the most gratifying event of the year," says Stuart Reeves, EDS' senior vice president. "We also began to see the marketing payoff from the skills, technology and know-how we're getting from our GM relationship. We finally started to leverage those skills into deeper penetration of our existing traditional markets."

Always a star player in financial services, EDS hit nova status in 1988. It signed its largest contract ever, a 10-year facilities management agreement with First City Bancorporation of Texas, the fourth-largest bank-holding company in the state. EDS' government systems and financial and insurance groups combined to win another megacontract, agreeing to provide the New Jersey Automobile Full Insurance Underwriting Association with full program management services to 425,000 policy holders. EDS also made its mark in the commercial arena, finalizing a contract to integrate manufacturing systems for Caterpillar Inc. and landing a 10-year deal with Freeport-McMoRan Inc. to handle the New Orleans-based mining company's MIS, computer operations and voice communications.

SERVICES
1,907.6

In the government sector, there was a six-year deal to implement unified LAN architecture for the Air Force, a five-year contract with the Marines to automate supply services and an eight-year pact with the Navy to convert the application support system for Stock Point ADP Replacement Conversion.

And GM chipped in with a five-year agreement for information-processing services to its Automotive Components Group and a four-year extension to an agreement with the Truck and Bus Group.

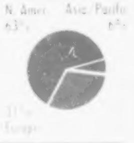
EDS was also heavy into acquisitions, picking up a 50% interest in China Management Systems, a huge Taiwan-based IS operation; purchasing MTech Corp., which operates the third-largest ATM network in the United States; and annexing the data-processing operations of two Texas banks. This was small stuff, though, compared with this year's first-quarter deal with Hitachi Ltd., in which the two parties agreed to buy National Semiconductor Corp.'s National Advanced Systems subsidiary.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

28 AMDAHL CORP.

Total DP Revenues 1,801.8

1250 East Arques Avenue
Sunnyvale, CA 94086
(408) 746-6000



MAINFRAME 1,225.2

DATACOM 90

PERIPH 216.4

SOFTWARE 12

SERVICES 24

MAINT 234.2

You might imagine that 1988 was a tough year for IBM-compatible mainframe pioneer Amdahl Corp. After all, popular wisdom has it that new applications are bypassing mainframes in favor of networked personal computers and workstations. The year saw IBM turn up the competitive heat when it began to ship both its new MVS/ESA operating system and 3380 model J and K disk drives, products Amdahl wasn't able to counter last year.

Still, in 1988 Amdahl continued its march up the DATAMATION 100 with a record $1.8 billion in revenues, up 19.7% over 1987's $1.5 billion revenue figure. Earnings jumped to $223.3 million, up 53% over 1987's level. The hot numbers were due to heavy demand for Amdahl's highly reliable 5890 mainframe, which competes with IBM's 3090 family. Altogether, Amdahl shipped over 300 processors in 1988, another record for the company. And the lack of 5890 support for IBM's new ESA operating system upgrade didn't seem to slow demand for the plug-compatible CPU. Most customers seemed satisfied with Amdahl's promise of ESA support by the fourth quarter of 1989.

In May, Amdahl scored another first. The company shocked the industry by announcing its next-generation mainframe family, the 5990, before IBM announced its upgrade 3090S series rather than waiting to react to IBM's marketing initiative. Based on technology from Fujitsu Ltd., the largest 5990 (the $13.1 million model 1400) was rated by the experts at 115 million instructions per second. That made it almost 50% faster than IBM's then-largest mainframe and seemed to swing the mainframe market and momentum toward Amdahl. By the end of the year, Amdahl had shipped over 40 of its 5990 mainframes. The company has predicted that 1989 CPU shipments will exceed 1988 numbers.

Amdahl also took a bold step in the storage arena. Although in 1988 the company continued to trail IBM's 3380 model J and K technologically, Amdahl did announce a radically new controller device. Amdahl's new 6100 controller, which started shipping in the fourth quarter of 1988, combines up to 32 input/output paths in a single controller. The result, says Amdahl, is faster total throughput and greater flexibility for the user.

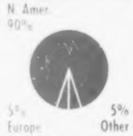
Amdahl also continued to demonstrate its commitment to open systems and the UNIX operating system. Amdahl became a member of UNIX International, the AT&T-associated consortium attempting to establish UNIX System V as an industry standard. Amdahl also continued its own internal UNIX development work. In early 1989, the company announced a major new release of its UTS mainframe which, for the first time, incorporated standard UNIX features such as the Network File System and selected features from the Berkeley Software Distribution 4.3 version of UNIX.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

29 TANDY CORP.

Total DP Revenues 1,792.4

1800 One Tandy Center
Fort Worth, TX 76102
(817) 390-3700



MICRO 1,232.2

PERIPH 409.6

SOFTWARE 150.6

In 1988, Tandy Corp., to use an apt Texas phrase, was as busy as a bobcat in a tow sack. Tandy inked numerous partnering deals with other manufacturers, announced an erasable compact disk and shipped one of the first IBM PS/2 clones. And in decidedly atypical actions, Tandy bought another company and began to sell its computers outside its familiar Radio Shack retail stores.

The first tipoff that 1988 would be an unusual year for Tandy came in March when Tandy purchased Grid Systems Corp., a Freemont, Calif.-based manufacturer of laptops and portable computers for the corporate and government markets. Tandy has given Grid Systems responsibility for all computer marketing efforts aimed at large businesses. Several of Tandy's high-end computers will be resold under the Grid label. Tandy hopes to avoid the home computer taint of its Radio Shack label, which seems to put off business customers.

In April, Tandy announced it would bring to market an erasable compact disk within the next few years. The company also introduced the Tandy 5000 MC, one of the first PCs compatible with IBM's high-end PS/2 models using the MicroChannel architecture. In any other year, that would have been the big news for Tandy.

But in June, breaking the hallowed tradition of selling its PCs exclusively through its Radio Shack stores, Tandy began offering some of its computer models through the Wal-Mart chain of department stores. And in October and November came two more surprises. First, Tandy announced an agreement with Digital to develop a new line of PCs to be sold under the Digital label. Then at Comdex, Tandy announced it was teaming up with Matsushita Electric Industrial Co. Ltd. (known in the United States for the Panasonic, Quasar and Technics brands) to resell its domestically manufactured PCs under the Japanese company's various labels to the U.S. market.

In many ways, those moves should have been expected. Tandy's Radio Shack outlets sell a lot of computers—401,000 in 1988 to be exact—but Tandy executives say PC sales outside the Radio Shack channel could reach 100,000 in 1989.

Tandy may need the help. DATAMATION estimates that Tandy's 1988 PC sales amounted to $1.79 billion, only a slight increase over 1987. And Tandy ran into a few problems at the end of the year. With memory chips in short supply, Tandy's low-end 8086 and 8088 PCs, traditionally big sellers at Christmas, were left waiting for customers during the December retail rush. Customers opted for Tandy's 80286 machines, which were in short supply by the time Santa came to get his supply. But Tandy doesn't see that year-end slowdown as firm evidence that its customers are moving to higher end PCs, and it still plans to market and improve the low-end models.

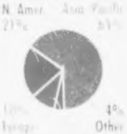
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

30

Total DP Revenues 1,727.5

RICOH CO. LTD.

15-5 Minami-Aoyama 1-chome
Minato-ku, Tokyo 107, Japan
(81-3)-242-5415



MINI 27.6
MICRO 393.2
DATACOM 850.3
PERIPH 230.7
SOFTWARE 93
MAINT 132.7

The emphasis Ricoh Co. Ltd. has been placing on its computer division—selling Hitachi Ltd. PCs and IBM System/55s and System/36s on an original equipment manufacturer (OEM) basis and acting as a sales agent for NEC Corp. office computers—appears to be paying off. Sales of Ricoh's information systems continued at a brisk pace, increasing by 20% to ¥221.4 billion ($1.7 billion). Personal computer sales, for example, which were estimated at ¥50.4 billion ($393.2 million), buoyed domestic IS growth.

Ricoh hopes to develop its computer business into another "earnings pillar" in its office automation equipment business, along with its copier business. Specifically, it aims to double sales of PCs and office computers to 70,000 units and 10,000 units, respectively, by fiscal 1990. To support the push, Ricoh plans to increase the number of its system engineers in those of its companies that distribute office equipment. It also intends to double its group sales staff to over 4,000 people by fiscal 1990.

The company's printer and facsimile businesses turned in solid performances, being primarily responsible for a 24% increase in Ricoh's overseas revenues. The company expects Japanese user requirements to broaden and for Group IV facsimile machines and multifunctional peripherals to therefore gain in popularity. The Communications Industry Association of Japan predicts that the export market for fax machines will grow an average of 15% annually through 1990.

Offshore production of both printers and fax machines is increasing. Last year offshore facsimile production increased by 50%, and Ricoh Electronics Inc., a Tustin, Calif. subsidiary, is scheduled to manufacture laser printers.

Unfortunately, Ricoh has been experiencing difficulties with its new LP6000 laser printer—a fair number of which have already been shipped and sold—in which excess toner is transferred to the page being printed. Confusion over who is responsible for maintenance and repair (the LP6000 is sold both under the Ricoh brand and through OEMs and distributors) has compounded the problem.

Ricoh's management, in trying to globalize its organization, initiated measures to create an independent North American operation. Accordingly, a third Tustin manufacturing plant has begun producing printer assemblies, complementing the activities of the firm's Irvine parts-processing plant and Santa Ana supply plant. Plans for a fourth manufacturing facility, near Atlanta, were also announced. Similarly, Ricoh plans to create a separate European operation designed to increase production capacity. In Japan, Ricoh completed a printed circuit board plant in Tottori Prefecture and added a new wing to its Research Institute of General Electronics in Miyagi Prefecture.

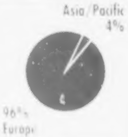
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

31

Total DP Revenues 1,716

ALCATEL NV

33 rue Emeriau
75017 Paris, France
(33-1)-40-58-52-68



MICRO 1[illegible]8.3
DATACOM 721.9
PERIPH 710.1
SOFTWARE 106.5
OTHER 59.2

Two years of restructuring may have made Alcatel NV a stronger company internally, but revenues in many areas have suffered as a result. Alcatel reports its accounts in European Currency Units (ECUs). Total revenues fell slightly in 1988 to ECU11.1 billion ($13.1 billion), down from ECU11.2 billion ($12.9 billion) in 1987, although net income was up 21.6% from 1987, to ECU421 million ($497.9 million).

While the company's core public-switching business continued to expand, its DP and data communications operations contracted as a result of continued divestitures in Europe and the United States. IS revenues decreased 18.5% to ECU1.45 billion ($1.7 billion), from ECU1.78 billion ($2.1 billion) in 1987. Sales of microcomputers dipped 29% to ECU100 million ($118.3 million), while revenues from data communications equipment dropped 32.2% to ECU610 million ($721.9 million).

Alcatel began life in January of 1987, following the merger of all the IS interests of France's Compagnie Générale d'Électricité (CGE) and ITT's former European telecommunications interests, which CGE acquired in December 1986. CGE has a 61.5% controlling interest alongside ITT's 37%.

The continued divestiture program of various inherited IS interests led to Alcatel's retreat from the U.S. market during the year after selling Qume Corp. and ITT's old Courier 3270 operations. In Europe, Alcatel unburdened itself of Danish services company Regnecentralen.

Alcatel has an estimated 18.5% of the worldwide public-switching market, putting it in second place after AT&T. Alcatel's worldwide business communications and IS activities, along with office equipment in general, are now grouped into a horizontal division called Alcatel Business Systems (ABS), which had 1988 revenues of ECU2.67 billion ($3.13 billion). Some 42% of that total was derived from voice and data terminals, with 31% coming from PBXs.

The main ABS subsidiaries are Face in Italy, Kirk in Denmark, SEL in West Germany, STK in Norway and Telic in France. Telic Alcatel, based in Paris, reported sales of FF3.888 billion ($652.8 million) in 1988. The subsidiary is France's leading supplier of private telephone equipment—with over 52% of the market—and the country's biggest producer of faxes (50,000 units in 1988).

Telic is the world's largest vendor of videotext terminals (551,000 units shipped in 1988). Telic has centralized production of most product lines in a futuristic new plant in Illkirch, near Strasbourg, France, inaugurated in September 1988.

Alcatel continues to market the Micromega range of multiuser micros supplied by Fortune Systems Corp., but has now added UNIX workstations from Convergent Inc. to its catalogue. The machines run Alcatel's UNIX-based operating system, ALTIX.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

32

Total DP Revenues 1,694

NIPPON TELEGRAPH AND TELEPHONE CORP.

1-6 Uchisaiwaicho 1-chome
Chiyoda-ku, Tokyo 100, Japan
(81-3)-509-5035

Last year, Nippon Telegraph & Telephone created a major new data communications subsidiary. The unit, NTT Data Communications Systems Corp., grew out of the transfer and reorganization of its Data Communications Sector. The company describes the goals of its new subsidiary as improving customer service and lowering the cost of its data communications operations.

DATACOM
508.2

With 6,800 employees and an initial capitalization of ¥10 billion, NTT Data will provide telecommunications services for Type II carriers—those that lease rather than own their telecommunications circuits and facilities. In addition, the new operation will develop, maintain, sell and rent data communications systems, peripherals and software and engage in data communications services.

IS revenues rose 33% to ¥217.1 billion ($1.7 billion), only a fraction of the company's ¥5.5 trillion ($42.9 billion) total revenues. Yet, IS represents a fast-growing business for the company and one with plenty of potential.

SOFTWARE
186.3

In fact, some industry observers feel that pressure from smaller competitors is forcing NTT to focus its efforts in the data communications business. NTT predicts the new subsidiary will see profits of about ¥8 billion ($62.4 million) on revenues of ¥262 billion ($26 billion) in 1990. Moreover, it predicts profits will rise fully 75% in fiscal 1991.

However fast growing its subsidiary, NTT has some serious problems in its mainstay operations, some of which stem from its reported involvement in the so-called Recruit Co. influence peddling scandal. NTT officials allegedly accepted bribes in the form of prelisted Recruit stock and sold two Cray Research Inc. supercomputers to Recruit under questionable circumstances. As a result, the Tokyo Metropolitan government in early 1989 excluded the telecommunications giant from the Tokyo Teleport Town project, a ¥128.1 billion ($1 billion) international computer and communications operation scheduled for completion in early 1994. To compound the problem, the city of Yokohama temporarily suspended NTT from public works contracts.

SERVICES
847

Even as the scandal simmers, NTT is under considerable pressure to continue on a path similar to AT&T's government-ordered breakup. In addition, the large number of new telecommunications and data communications entries is eroding NTT's previous position. As a result of this newly competitive atmosphere, NTT has been forced to cut its rates.

In April, NTT began offering integrated services digital network (ISDN) capabilities in Tokyo, Nagoya and Osaka. Current plans call for the services to be extended to other major Japanese cities. But the company has said that further advances in digital telecommunications will be required before nationwide ISDN services can become available.

MAINT
152.5

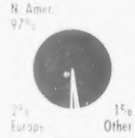
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

33

Total DP Revenues 1,617

AUTOMATIC DATA PROCESSING INC.

1 ADP Boulevard
Roseland, NJ 07068
(201)-994-5000



Automatic Data Processing Inc., the grand old party of the batch-processing service providers, continues to change its look. Batch is out and interactive is in. With a new chief operating officer, William J. Turner, a new president for its Brokerage Information Services Group, AT&T veteran Robert Casale, and a raft of new managers, ADP is revamping its technology, moving further toward on-line services for its customers. Why now, with revenues up 10.2% for the year to $1.62 billion, and profits up just a hair under 19% to $178.2 million? As handsome as those numbers appear, they represent the lowest annual increase in revenues in recent years. But, ADP has wrung more profits out of each revenue dollar, and last year profits hit 11% of sales. The revenue increase maintained ADP's record of having scored at least 10% revenue rises each year since the company went public in 1961.

ADP's best known service, the preparation of payrolls for companies large and small, now accounts for half of its revenues and employees. According to ADP, each payday in 1988, the company handled 200,000 payrolls in Brazil, Canada, the United States and Western Europe.

In 1988, the Brokerage Information Services Group kicked in 25% of ADP's business. During ADP's fiscal year, ending in June 1988, capital expenditures of $187 million were over twice the amount spent in each of the previous years. Most of the money—$100 million—went into brokerage services. The inspiration was the meltdown on Wall Street: in the week of October 19, 1987, ADP handled transaction volumes that passed 500,000 transactions each day; each day it processed more than 3 million real-time messages and orders and delivered more than 14 million stock quotes.

SERVICES
1,617

Equipping itself to handle huge volumes was complicated by a move of ADP's processing center from New York to Jersey City, N.J., and a move to more distributed processing based on IBM PS/2s. ADP's chief competitor in the stock quote business, Quotron Systems Inc., bought by Citicorp in 1986 for $860 million, lost business to ADP at big accounts like Merrill Lynch and Shearson Lehman.

ADP's edge is technology. While Quotron still relies on dumb terminals to deliver the goods, ADP is moving to PS/2s to deliver multisourced data—some of it customer generated, some supplied from ADP's computers—that can then be manipulated on the PCs. The system is called FS Partner.

Dealer Services is ADP's third-largest business, providing 16 different services to more than 6,500 automobile, truck and heavy equipment manufacturers and dealers in the United States and Canada ADP's Banking Services Group serves more than 25,000 ATMs nationwide. Monthly ATM transaction volume grew by 50% from 1987, reaching more than 12 million transactions per month.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

34

Total DP Revenues 1,594

PRIME COMPUTER INC.

Prime Park
Natick, MA 01760
(617) 655-8000

It's nature's law and that of the corporate jungle, too: sooner or later, the hunter becomes the prey. Prime's turn came in the fourth quarter of 1988, seven years into a growth-by-acquisition strategy that has tripled the company's size and vaulted it to revenues of $1.59 billion. This is tantalizingly close to the $2 billion "critical mass" that then president and chief executive Joe Henson, the architect of this strategy, was aiming for by 1990.

Prime's fourth quarter should have been a time of celebration. The trauma of the company's Computervision Corp. takeover (completed in February 1988) had eased, and Prime was now a solid number 2 after IBM in the lucrative computer-aided design manufacturing (CAD CAM) market. By October, the company was ready to buy Calma Co. from General Electric Co. to reinforce its position. But Prime would soon reel under a hostile takeover bid, layoffs, restructuring and Henson's resignation.

MINI
623.7

By March of 1989, the month Prime announced it was for sale, it was clear it would lose its independence, as well. Company insiders expect the likely buyer, MAI Basic Four Inc., to sell off Prime's assets —especially Computervision.

To frustrate such a move, Prime is reorganizing into three autonomous geographic business units— the Americas, Europe and the Middle East, and the Far East—each with separate profit and loss accounts. Prime's hope was that the layoffs of about 1,200 employees, 10% of the work force, coupled with the restructuring, would make the company more attractive as an independent concern.

PERIPH
313.1

The minimaker has made no secret of its desire not to be acquired by controversial investor Bennett S. LeBow, MAI Basic Four's controlling party, and would prefer instead a "white knight" such as its biggest customer, Ford Motor Co.

SOFTWARE
97.2

One central question is: What will happen to Prime's traditional minicomputer business? Some 60% of the company's research and development is still dedicated to large minis even though the market growth is in CAD CAM, and the minicomputer is perceived as dying. Prime has built up an enormous franchise over the past 17 years; its 50 series customers currently number 23,000 worldwide. But these customers want reliability more than innovation.

Prime's plan had been to integrate its minis into a wider vision—labeled Computer-Aided Business (CAB)—whereby the machines could play a vital role as network hubs. Will this be the new buyer's vision?

MAINT
560

Meanwhile, the company announced a push into consulting services and the first standardized pricing of related packages and products. Prime also added two more EXL supermicros: primarily UNIX-based systems that also combine PICK and MS DOS. Then there is System 9, a hot new geographic information system product Prime recently purchased from Swiss company Wild Leitz.

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

35

Total DP Revenues 1,487.7

SEIKO EPSON CORP.

80 Hirooka-shi Jinshi
Nagano-ken 392
(81-0266) 52-2552

Seiko Epson Corp. was founded in 1985 to contain several business operations, some of them more than a century old. Its best known products are Seiko watches and Epson printers and PCs.

MICRO
282.7

Seiko Epson's strategy divides the world into four interdependent zones: North and South America, Asia and the Pacific, Europe and Japan. Each zone is responsible for all of its business activities—from product design and planning through production and sales.

Mitsuhiro Tsuchihasi, senior managing director and corporate general manager of sales and marketing, describes the evolution of the firm's international business operations as a process that began at "isolated points" (individual companies), which were then joined into "lines" (several companies) and "planes" (zones). The final structure is meant to function like a network. Seiko Epson says the new setup is intended to foster a global consciousness among its employees and, at the same time, reorganize existing managerial structures. According to the company, sales and production activities already operate under this global, multilocal strategy.

In the IS business, Seiko Epson is best known as a printer company. Each month, the company says it makes more than 1 million printer mechanisms, accounting for more than 60% of the world's printer mechanism market share. Its printheads are used in calculators, point-of-sale terminals, electronic cash registers and airline boarding pass and ticket printers as well as in computer printers.

IS revenues were up 10% to ¥190.6 billion ($1.5 billion). Total revenues were ¥349.1 billion ($2.7 billion), an increase of 11.6%. R&D expenditures were ¥31.8 billion ($248 million), up 12.8% from 1987, amounting to 9.1% of revenues.

PERIPH
1,205

Epson America Inc. along with Epson Canada Ltd. and Epson Latin America Inc. are Seiko Epson's Western hemisphere marketing affiliates. Headquartered in Torrance, Calif., Epson America claims the largest share of the market for nine-pin and 24-pin printers sold through computer store distribution channels in the United States. Epson America also lays claim to between 4.6% and 6% of the U.S. personal computer market.

In 1988, other activities outside Japan included establishing Epson Engineering France for R&D purposes, opening the Epson Technology Center in Silicon Valley to coordinate R&D in the United States, manufacturing PCs at Epson Telford Inc. in the United Kingdom, establishing Epson A/S in Denmark and establishing Tianjing Epson Co. Ltd. in China.

Seiko Epson has announced the world's first 48-pin printhead, incorporated in the Epson TLQ-4800. The firm has also developed the world's first full color video projector based on a liquid crystal panel and miniaturized optical system.

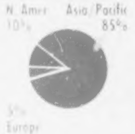
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

Advances in chip technology allow most hardware suppliers in the Top 100 to continue to boost the performance of their systems while holding prices steady.

36
Total DP Revenues 1,472.1

OKI ELECTRIC INDUSTRY CO. LTD.

7-12 Taranomon 1-chome
Minato-ku, Tokyo 105, Japan
(81-3)-501-3111



MINI **125.1**
MICRO **19.1**
DATACOM **279.7**
PERIPH **913.3**
SERV **98.1**
MAINT **36.8**

All three of Oki's business segments (telecommunications systems, information-processing systems and electronic devices) showed firm sales in 1988. Total revenues climbed 19.6% to ¥552.6 billion ($4.3 billion), with IS sales up 14.7% to ¥188.7 billion ($1.5 billion). Manufacturing operations were stepped up, resulting in increased profitability. Despite being hampered by exchange rates and trade frictions, Oki took advantage of the strong yen to raise overseas procurement and increase the output of new products.

In December, Oki commenced operations at a new plant in Miyagi Prefecture, where ultra-large-scale-integrated (ULSI) circuits, such as the firm's 1-megabit dynamic random access memory, will be manufactured. In the future, the plant will manufacture 4Mb DRAMs. In the United States, Oki is expanding its mobile telephone plant capacity and is constructing a printer plant. Integrated circuits (ICs) will be produced at an as-yet-unidentified European site, in addition to its existing printer plant in Scotland.

In Japan, Oki plans to relocate its Tokyo plant to Shizuoka and to construct a new headquarters building there. Four other plant relocations are planned, including its Hachioji facility.

Oki boosted spending on research and development 38% to ¥35.5 billion ($277.2 million), which included its ongoing participation in national projects involving advanced technology. These include the Fifth-Generation Computer Project, high-speed logic and three-dimensional ICs, operation-specific robots, data bases that can be accessed by different types of computers and optical and electronic ICs.

Telecommunications R&D focuses on digital communications in preparation for ISDN. In electronic devices, Oki developed an ultralow-noise high-electron mobility transistor (HEMT) that reduces noise in satellite communications by 50%.

In information processing, the company's emphasis on integration is seen in such products as the OKITAC 8300 integrated office processor and the ifCOM-11 PC/telephone/communications workstation. Oki now offers 24 × 24 dot matrix printers that are among the fastest made in Japan. Other new systems include a Japanese-English translation system capable of scanning handwritten and printed documents and an integrated mobile communications system incorporating a G3 facsimile transceiver, computer terminal and hands-free telephone.

For Oki's U.S. printer subsidiary, Okidata, 1988 was a history-making year in terms of printers sold and profitability. The nine-pin Microline 320 and the 24-pin Microline 390 and 393 dot matrix units were the biggest sellers. Okidata says many of its dot matrix printer sales came from being a top supplier to value-added resellers in the financial services, medical and manufacturing markets.

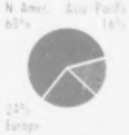
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

Striking Gold With Workstations

Commercial users join techies as aggressive pricing and high performance help Sun keep shining.

37
Total DP Revenues
1,461.6

SUN MICROSYSTEMS INC.
2550 Garcia Avenue
Mountain View, CA 94043
(415) 960-1300



MINI
1,096.2

PERIPH
146.2

SOFTWARE
73

SERVICES
146.2

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

If and when the day of truly open systems dawns, information technology vendors will find themselves in a new game with a new set of rules. No longer able to charge hefty prices to users who are locked into proprietary hardware and software, vendors will be forced to accelerate innovation and accept lower profit margins if they wish to compete.

At least one vendor seems to be operating as if that new open systems reality were here today. Sun Microsystems Inc. of Mountain View, Calif., has combined a breakneck pace of new product introduction with aggressive pricing, a commitment to open systems and what it calls network computing. The result has been breathtaking growth. In just seven years, Sun has blossomed into a $1.46 billion company and what Dataquest Inc. has called "the star of the show" in the $4.1 billion workstation market.

Scott McNealy, Sun founder and CEO

In 1988 alone, Sun's revenues grew 93.4%, and its profits were up 86.7% to $89.6 million. Dataquest figures that Sun, by the end of 1988, accounted for 28.3% of the worldwide workstation market, up 4.2% over 1987. Sun captured market share from rivals Apollo Computer Inc., which dropped 4% to hold a 13.5% market share, and IBM, which dropped 1.1% to 2.6% of the market. Sun's success helped push Apollo into the waiting arms of Hewlett-Packard Co., which acquired the workstation vendor early this year.

Sun succeeded by breaking down barriers in pricing and performance and by cashing in on demand from technical users and a growing number of commercial users. Unlike many personal computers, Sun's workstations offer multitasking and multiuser support, as well as common file access and high-resolution, high-speed graphics. These features have made Sun a favorite with vast numbers of technical users involved in software engineering and design automation. Those market segments represented 68% of Sun's total users in 1988.

Lately, however, Sun's workstations have also become popular among less technical users, such as securities firms and publishers. "The concept of distributed, network-based computing using workstations and servers has captured the imagination of *Fortune* 2,000 users," says Sun corporate marketing vice president Ed Zander. The desktop revolution that started in the early 1980s with PCs has evolved to demand both the power and open systems approach represented by networked workstations, states Zander.

To drive home the point that workstations are the next stop in desktop evolution, Sun has moved aggressively in the past year to increase the power of its workstations, while driving workstation prices down near personal computer levels. Sun, which in 1988 introduced workstations based on its own reduced instruction set microprocessor design, called SPARC, exploited the architecture throughout 1988 and into 1989. In 1988, Sun introduced a low-end, 7-million-instructions-per-second (MIPS) version of its SPARC-based Sun 4 product line with a $19,950 base price. The company followed that early this year with a 12.5-MIPS version having a base price of $8,995. Currently, SPARC-based systems account for about 25% of Sun's unit shipments, which in 1988 amounted to 90,000 workstations.

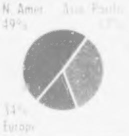
According to Zander, Sun will continue to place its bets on open systems and aggressive new product and pricing strategies. "We believe in open systems with a fervor," he says. "We understand the model, and we continue to pursue it." In 1988, Sun spent a whopping 13% of its revenues on research and development. Sun executives have said they plan to continue R&D spending at that rate, well above the industry average. At the same time, Sun's aggressive pricing has kept its operating margins low, just over 10%. Many observers expect that to continue, as well. ▭

38

Total DP Revenues
1,424.7

TANDEM COMPUTERS INC.

19333 Vallco Parkway
Cupertino, CA 95014
(408)-725-6000



MAINFRAME 557
DATACOM 140
PERIPH 393.7
SOFTWARE 85
SERVICES 25
MAINT 224

In 1988, Tandem Computers Inc. completed two acquisitions, made nearly a dozen strategic partnerships and found a better way to manage itself. It promoted five executives to senior vice president status and consolidated the far-flung company into five operating groups. The reorganization came in June, at a point when the company was facing a second quarter of profit declines—down 33% from the previous year—as Tandem missed software delivery dates for its fast-selling smaller NonStop computer systems, the CLX.

Tandem, however, recovered in the September and December quarters, to end the year with a $102.1 million profit, virtually unchanged from the prior year's $101.9 million. Revenues, however, soared 30.7% to $1.4 billion, in part reflecting the acquisition of Ungermann-Bass Inc., which added about $140 million to 1988 revenues. Excluding both 1988 acquisitions, Ungermann-Bass and Atalla Corp., Tandem's sales were up approximately 16%.

The flat earnings were due to a change in Tandem's product mix, as the market for its traditional large systems gave way to a demand for its smaller ones, such as the CLX. Because of the acquisitions and the company's determination to maintain a technical lead in the on-line transaction-processing (OLTP) business, research and development spending soared 48.7% last year to $179.6 million.

In May 1988, after taking a small position in Integrated Technology Inc., a Plano, Texas-based telecommunications software company, Tandem bought out 100% of the company and renamed it Tandem Telecommunications Systems Inc. It also completed the merger with Atalla, which is involved in data security products in finance and retail. "We are now a family of companies focused on the evolution of OLTP to the on-line enterprise," said president and chief executive James G. Treybig.

The company has agreements with Apple Computer Inc. and AST Research Inc. to incorporate their personal computers into OLTP networks. Under what it calls its alliance program with other companies, Tandem struck a deal with Motorola Inc.'s Communications Sector to sell a product to utility companies called the Resources Management System, which consists of Tandem NonStop systems and Motorola application products. Tandem also has an agreement with MIPS Computer Systems Inc. to develop extensions to Tandem's UNIX offerings using reduced instruction set computer (RISC) technology. Its Tandem Telecommunications Systems group is working on Integrated Services Digital Network (ISDN) products with AT&T.

Overseas business suddenly began to shoot up at the end of 1988, accounting for just over half of Tandem's revenues last year. The news inspired financial analysts to raise their expectations for the company's 1989 performance.

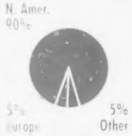
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

39

Total DP Revenues
1,356

ZENITH ELECTRONICS CORP.

1000 Milwaukee Avenue
Glenview, IL 60025
(312)-391-7000



MICRO 1,220.4
PERIPH 135.6

Zenith Electronics Corp. went back to what it hopes will be its future in 1988, showing its first profit in three years. The return to profitability was both welcome and well timed, as Zenith had engaged in a year-long cliff-hanger struggle against dissident shareholders eager to see a change in company direction. To avoid the Wall Street raiding party, the company even attempted to sell its hallowed, though unprofitable, television division. In the end, Zenith slipped out of the raiders' grasp just before the final credits rolled at the end of the year.

That episode behind the company, at least for the moment, Zenith officials celebrated its return to the black at the end of the year, a profit of $11.7 million compared with 1987's loss of $19.1 million. Contributing the lion's share of the black ink was the company's computer systems and components division; gravy came from the consumer electronics division, which showed a pretax profit of its own. The computer systems and components division owed much of its 1988 success, as it had many of its past profitable quarters, to the U.S. government, which accounted for more than a third of the company's $1.35 billion in computer and component sales.

Several of the company's major government contracts are ending this year, however, leading Zenith to rely on the retail sales channel for PC sales more than in the past. Through agreements previously made with major computer retail chains, as well as through the company's own Heath/Zenith Computers & Electronics chain, sales of Zenith PCs rose 46% in 1988 from 1987's levels. Despite rapid growth in the retail area, Zenith may see its fastest PC growth occur through original equipment manufacturer (OEM) agreements with other domestic and European companies. In 1988, Zenith signed four multimillion-dollar OEM agreements, including a deal with Hewlett-Packard Co. to market a Zenith laptop computer under HP's label.

Although the company's laptop and portable computers have gotten the most notice, standard IBM-compatible desktop computers account for the majority of PC sales by the company. Most of its new products in 1988 were tweaks and redesigns of earlier systems, but in February 1989 the company introduced its fastest PC, the Z-386/25, based on Intel Corp.'s 80386 microprocessor operating at 25 megahertz. By the end of this year, the company expects to introduce a 32MHz PC, based on the Extended Industry Standard Architecture (EISA).

The company also made a strong move to enter the UNIX and workgroup computing market last year, announcing a multiprocessing technology that uses up to six 80386 chips operating simultaneously. The new family of products will operate UNIX software and will be able to serve as a series of desktop terminals and/or a network of PCs. The first product shipped in February 1989.

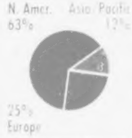
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

Seagate Comes Back From the Brink

A nimble disk drive vendor does some fancy stepping to recover from a forecasting disaster.

40
Total DP Revenues 1,351

SEAGATE TECHNOLOGY
920 Disc Drive
Scotts Valley, CA 95066
(408)-438-6550



PERIPH
1,351

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

At its beginning, 1988 looked like it would be a great year for the disk drive business. Sales of the major players had been soaring, rising 75% or more since 1988. Everybody poured money into more plants and new equipment. But by midyear the picture had changed drastically: the bottom fell out of the market, and the disk drive business had become an easy one in which to look bad. Real bad.

Seagate Technology Inc., the biggest player in the market, with over a billion dollars in 1987 revenues, had poured $290 million into new facilities, doubled its work force to 30,000 and bought two suppliers. Then in the three months that ended Sept. 30, it reported a staggering pretax loss of $71.3 million ($52.8 million after providing for write-offs).

Alan Shugart, founder and CEO of Seagate

A sudden slowdown in demand forced virtually all disk drive manufacturers to slash production rates as well as prices—a situation that knocked the socks off Seagate, whose strategy has been to produce in high volumes, using low-cost manufacturing methods. Its stock plunged from a high of $23 to $7 per share. A company that had found it difficult to do anything wrong suddenly found itself exemplifying the kinds of strategic blunders that can destroy a company. Seagate chairman Alan Shugart sees no solution to such faulty forecasting. "If I could figure it out, I wouldn't tell anybody. All technology businesses are tough to forecast, whether it's disk drives, or computers, or CRTs or semiconductors. . . . It's been that way my whole life, and it probably was the same with vacuum tubes."

Seagate, which makes rigid disk drives for smaller computers, hadn't fully anticipated the growing demand for newer 3½-inch drives and had continued to gear up for its traditional 5¼-inch products. In a filing with the Securities and Exchange Commission, the company said that if the 3½-inch drive business adversely affected the 5¼-inch market and if Seagate's 3½-inch market weren't as big as the 5¼-inch market, "the company's future financial performance would be seriously impacted."

Seagate slashed prices to make up for a serious cash position. For example, at midyear, it cut the price on 85MB 5¼-inch drives to $500 from the $600 to $700 range. The $396 million in cash that it had at the beginning of its fiscal year was down to $93 million by June 30 when its 1988 fiscal year ended.

But Seagate rebounded in the fourth quarter of 1988 to end the year with total revenues of $1.4 billion, somewhat higher than the $1.08 billion mark it set in 1987. Its huge loss of $71.3 million in the quarter that ended in September gave the company an overall 1988 loss of $5.5 million, despite a fourth-quarter profit of $7.6 million. In 1987, Seagate reported a profit of $115.3 million.

Wall Streeters attribute the quick improvement to the fact that Seagate trimmed its inventories by $30 million and launched massive layoffs of nearly 4,000 employees. Its cash at the end of the year doubled to $80 million from its cash on hand at the end of 1987. Most critical to the recovery, though, was the introduction of new 3½-inch drives, at higher per unit prices than its 5¼-inch drives.

As a result of new 3½-inch drives, the company in the fourth quarter achieved an average price of $246 for its 1.3 million models shipped, including 5¼-inch and 3½-inch designs. This compared favorably with the average price of $234 the company achieved in previous quarter when it shipped 1.2 million units. Part of the shift in product mix included a change in emphasis from the older ST 225 line of 5¼-inch drives to its newer and faster (and higher priced) ST 251 family.

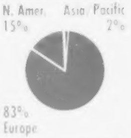
The dramatic turnaround in the quarter that ended in December, followed by a hefty $21.5 million in profits in the first three months of 1989, is a comeback story in an industry where second chances have been rare indeed. ▭

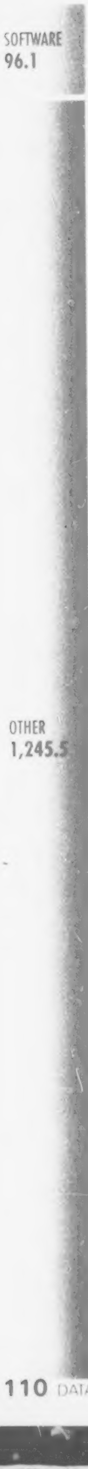
41

Total DP Revenues 1,341.6

ATLANTIC COMPUTERS PLC

Winchmore House
12-15 Fetter Lane
London EC4A 1BR, England
(44-1)-583-9481





Atlantic Computers PLC began 1988 as the only major independent IS leasing firm left in the United Kingdom following a rash of takeovers in the European leasing sector during 1987 by Econocom International BV in the Netherlands and Inspectorate International in Switzerland.

That independent status lasted a mere nine months. In September, the company agreed to a takeover bid by British and Commonwealth Holdings (B&C), a U.K. financial services group. The price was £407 million ($724.2 million). Atlantic had lost credibility over confusion about its financial accounting during the year, and its price per share had dropped drastically.

B&C bought a company that ended the year with revenues up 19.9% to £754 million ($1.3 billion) and profits up 23.3% to £37 million ($65.8 million). But B&C was uncomfortable with Atlantic's attempts at diversification. The Atlantic Network Systems Division, which the company had made bullish predictions for in 1988, saw revenues increase by 60% in the first six months, but still reported a loss over the same period. Atlantic divested the operation late last year to a U.K. firm called Tricom Communications Ltd. The divestiture program continued into 1989 with the recent sale of the MPL power systems division to its management.

Unlike the Atlantic's diversification scheme, B&C was happy about Atlantic's own takeovers during the year. In August 1988, Atlantic announced three European acquisitions for which it paid £11 million ($19.6 million). The acquired companies were ICS in Norway and Denmark, B&B Finanz in Austria and Ljus och Kraft Data/Installation (LOK), a Swedish firm that designs and installs local data communications systems and wiring networks.

In October, Atlantic began an acquisition drive in the United States to build up its North American operations. The first purchase was Datalease, a Westport, Conn., company that had a 1987 turnover of $25 million from leasing IBM midrange System 3Xs. In December, Atlantic shelled out another $20 million for two U.S.-based leasing firms: Princeton Computers in Cranbury, N.J., and GS Computer in Irvine, Calif. During 1988, Princeton had sales of around $70 million and GS had sales of around $30 million.

These companies were merged with Atlantic's U.S. operations, which helped to push the share of U.S. revenues up from 5% in 1987 to 15% in 1988. This increase only included three months of Datalease's sales and a month of sales from Princeton and GS, so Atlantic expects another significant boost to its U.S. business when the full year of sales from these operations are included this year. Meanwhile, Atlantic has embarked on a geographic expansion program with new operations in Singapore and New Zealand. More are slated for this year.

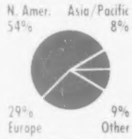
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

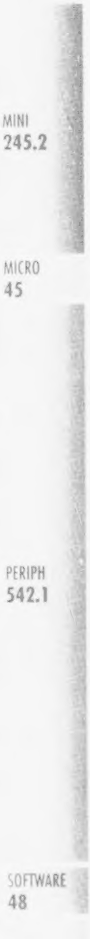
42

Total DP Revenues 1,330.5

DATA GENERAL CORP.

4400 Computer Drive
Westborough, MA 01580
(617) 366-8911





In 1988, Data General Corp. was born again. After four years of blaming conservative and cyclical buying trends for weak sales and mounting losses, DG last year conceded that larger forces were at work. It discovered open systems with all the fervor of a sinner redeemed.

Data General turned away from its proprietary past and outlined a new philosophy involving commercially designed microprocessors and the AT&T UNIX operating system. DG's new generation will build on Motorola Inc.'s 88000 reduced instruction set computer (RISC) technology and a version of UNIX tailored to commercial applications. In a move unprecedented in DG's 20-year history, major new systems will no longer provide the software compatibility that helped DG users move from the 16-bit Nova to the 32-bit Eclipse/MV families.

But, for all the change, there was a lot of sameness to the year. As in years past, the losses accompanied yet another bout of firings and plant consolidations. Moreover, the RISC/UNIX family will continue some traditions. Historically, the company responds to bad times by leapfrogging competitors with more powerful and less expensive processors. This time, the plan involves designing a faster version of the 88000. With first access to systems incorporating the faster chip, the company hopes it can deliver better price/performance than other Motorola RISC computer suppliers. While some RISC/UNIX systems are expected in the first half of 1989, those incorporating the DG-designed processor won't be available in large numbers until 1990.

As it hits the open systems road, DG does not wish to neglect users of the proprietary Eclipse/MV family. Newer Eclipse/MV computers, it promises, will sustain users and the company until the RISC systems arrive. Underscoring that promise was the debut of a low-cost MV/2500, which preceded the fall unveiling of a top-of-the-line MV/40000, in uniprocessor to quadratic versions.

Still, the delay between the MV/40000's fall unveiling and volume shipments stalled the purchase plans of enough Eclipse/MV loyalists to crimp sales for the calendar year and spill more red ink. At year's end, revenues totaled $1.3 billion, barely higher than the prior year's figures or those of the year before that. Losses—primarily from charges associated with a new round of plant closings—reached $48.9 million, less than half of 1987's $111 million loss.

A rising proportion of the company's sales are being made outside the United States. All its revenue growth last year occurred in Japan and Europe. Sales outside the States climbed 12% to $612 million from 1987's $547.6 million. While largely the result of a weak U.S. dollar, the sharp increase put DG's non-U.S. revenues—46% of its total—within ambition's distance of home market revenues.

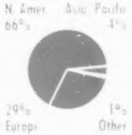
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

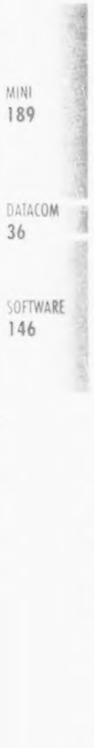
43

Total DP Revenues
1,289

MCDONNELL DOUGLAS CORP.

P.O. Box 516
St. Louis, MO 63166
(314) 232-0232





In a year when it expected to rejoin the ranks of the living, McDonnell Douglas Information Systems Co. (MDISC) bombed. It lost $76 million, a hefty 81% increase over the previous year's $42 million bummer. MDISC admitted in its annual report that "each of the [IS] segment's major lines of business performed below expectations, with the exception of Network Systems."

However, confessions don't cut it at the bottom line. MDISC hasn't had a profitable year since its birth in 1984, and 1988 was its second-worst year. Already in a bath of red ink, how will the company prevent a hemorrhage?

"Our expectations far exceeded reality last year," says Gareth Chang, MDISC's senior vice president of marketing and planning. "We overestimated ourselves. It was a very sobering experience. We're far more realistic this year."

And the company is far smaller as well. MDISC decided it was trying to compete in too many parts of the computer information services market and that it had been too optimistic in most of its forecasts and planning assumptions. Facing the music, MDISC cut 600 of its 11,000 employees last fall. It also sold Vitek Systems Inc., a health-related business, as well as its interest in a health maintenance organization. MDISC's third health-related company was expected to be sold in the first half of 1989. MDISC also kissed off direct sales of computer systems in North America.

That left Network Systems, Systems Integration and Computer Applications as the company's raison d'être. But, if a turnaround is going to happen, such a triumvirate is not all that unstable a foundation.

Network Systems, based on Tymnet, is the second-largest data transmission network in the United States and one of the largest internationally. Tymnet added 40 U.S. cities to its network last year, bringing the total number of cities served to 800. MDISC also added Network Applications Services to Network Systems as the first step in turning Tymnet into an international platform for value-added services. Systems Integration was restructured from several disparate units into four closely related pieces. MDISC won two state government contracts: one from Massachusetts as the primary systems integration vendor for all state environmental regulatory agencies, and one from Pennsylvania's Department of Environmental Services. Computer Applications played a significant part in MDISC's 18% increase in international revenues.

"Our agenda's narrowed and it's very clear," Chang says. "We've focused down to a few niches we can be successful in. We've removed the myth from systems integration forecasts, for example. We know we're not going to have 35% more revenue than the previous year; 15 to 17% is much more realistic. It brings us more valued added, too."

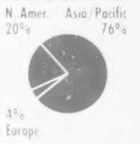
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

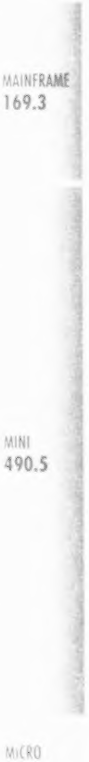
44

Total DP Revenues
1,270.7

MITSUBISHI ELECTRIC CORP.

2-3 Marunouchi 2-chome
Chiyoda-ku, Tokyo 100, Japan
(81-3) 218-2111





In 1988, Mitsubishi Electric Corp. took steps to offset the appreciation of the yen. It streamlined operations and product development, reformulated business strategies along more aggressive lines and established a global satellite network for manufacturing, sales and parts procurement.

The digital network is called MIND. It was installed to connect Mitsubishi and its 2,300 domestic subsidiaries, affiliates and sales centers, and will eventually link all Mitsubishi locations.

Mitsubishi's IS sales were up 7.5% to ¥162.8 billion ($1.3 billion), while net income was up 107.1% to ¥39.3 billion ($307 million). Mitsubishi's information-processing systems range from PCs to general purpose mainframes. The firm's mainframe computer business, however, has not been as successful as had been hoped, owing largely to inadequate applications and operating system software. Sales of U.S.-made Mitsubishi PCs began last year.

Also in 1988, Mitsubishi introduced its Intel Corp. microprocessor-based 32-bit M3300 series workstation and the Melcom PSI-II. An upgraded version of its Melcom PSI, the PSI-II is Japan's first AI workstation, a product of the government-sponsored Fifth-Generation Computer Project. Improvements in disk drives continued, and innovations in peripherals included high-resolution color monitors, high-speed thermal transfer color printers and a high-capacity memory card.

On January 1, 1989, Mitsubishi established Mitsubishi Electric France SA, a new $3 million wholly owned subsidiary headquartered in Paris. Its first product, which will be manufactured in Etrelles, will be cellular mobile telephones.

In December, the company announced the successful development of what it billed as the world's first optical "neurochip." The prototype device, which will be the basis for what the company calls an "associative optical neurocomputer," has a three-dimensional design and can be installed on a single board, together with existing large-scale integration (LSI) chips. On the more conventional semiconductor front, Mitsubishi, along with NEC Corp. and Toshiba Corp., announced in February the development of a 16-megabit dynamic random access memory (DRAM) chip. Yamaichi Securities Co. Ltd. reports that a 46% increase in integrated circuit sales was responsible for a 22.7% rise in sales for Mitsubishi's data communications/electronic device division.

A December report from Yamaichi also predicts that Mitsubishi will benefit the most from the Japan Defense Agency's expanding budget. Yamaichi says the Mitubishi's growth in this area will outpace its competitors because of its leading position as a defense contractor and because of new products, such as a radar system that could be adopted for the FSX fighter aircraft.

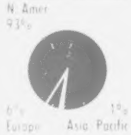
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

45

Total DP Revenues 1,253.4

COMPUTER SCIENCES CORP.

2100 East Grand Avenue
El Segundo, CA 90245
(213) 615-0311



In its second year as a billion-dollar company, Computer Sciences Corp. was moving "according to plan," as chairman and president William R. Hoover put it in the annual report. An important element of that plan is to boost CSC's market share of professional services to commercial customers. A dominant provider of systems and services to the federal government, CSC reported hefty 1988 federal revenues of $817.4 million, a 15% increase over 1987. But it was in nonfederal professional services that it grew the fastest last year—revenues increasing 24% to $135.4 million, compared with $108.8 million the year before.

Total revenues of $1.25 billion rose 10.5% over 1987's $1.13 billion, and earnings soared 22% to $49.5 million from $40.5 million the year before.

To shore up its commercial Professional Services operations, CSC last year acquired Index Group Inc., a Cambridge, Mass.-based consulting firm that helps large companies plan strategy and offers educational and research services focused on the uses of information technology. In 1986, CSC had acquired Computer Partners Inc., which immediately formed a systems integration group. Computer Partners and Index will lead CSC to commercial jobs with the help of CSC's existing Systems Group, which does systems integration for the federal government. The Systems Group will also provide the other two commercial units with project management and communications services. The commercial part of the systems integration market is estimated to be growing twice as fast as the federal part, and CSC wants it to account for half of the company's operating profits.

SERVICES
1,253.4

The company also operates a credit-reporting system, which last year accounted for $106.8 million in revenues, up 6% from 1987. Complementary services, including a computer-integrated manufacturing (CIM) system called MANFACT II and a tax preparation service, accounted for $26.3 million, up 2%. Health and insurance systems dropped 23% to $83.7 million after the company lost the state of California health insurance program, and revenues from its Network Services subsidiary, Infonet, rose 2% to $83.8.

Infonet, an international packet-switch network serving 31 countries, was partially spun off to a combination of French, German, Scandinavian and Spanish PTTs (postal, telephone and telegraph administrations), which use Infonet to link their public data networks.

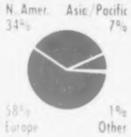
CSC plans to spin off more of Infonet this year, eventually retaining a 30% interest. Chairman Hoover says the move was a chance to form a closer relationship with these PTTs and to "position Infonet to capitalize on telecommunication interconnection requirements in Europe's 1992 transition into a common market."

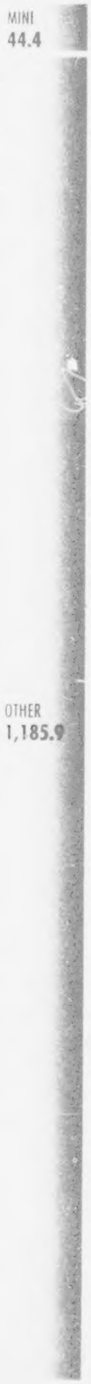
46

Total DP Revenues 1,230.3

INSPECTORATE INTERNATIONAL LTD.

Case Postale 63
3000 Berne 63, Switzerland
(41-31) 46 21 61





This fast-growing European IS-leasing company was created within a few years by financier Werner K. Rey through a series of takeovers on both sides of the Atlantic.

Inspectorate International Ltd. began as an inspection and quality control business, providing inspectors to firms trading in commodities. Rey branched out and acquired a cluster of computer-leasing and service companies that have transformed it into a strong IS company. In computer leasing, the company is number 1 in Europe and now number 2 in the United States. It is also engaged in software development and systems engineering at home in Switzerland.

Last year was one of consolidation for the company, as it digested the major British acquisitions of 1987 (IBL and United Leasing PLC) and merged them with its existing operations. The company's 1988 revenues, at SFr2.47 billion ($1.7 billion) were almost exactly the same as those for 1987, while IS revenues were down slightly to SFr1.8 billion ($1.2 billion), representing nearly 73% of the company's total. Earnings before taxes and interest amounted to SFr193 million ($132 million), of which IS activities generated SFr84 million ($57.4 million).

The company's diversification began with the acquisition of the U.S. leasing firm, The Meridian Group, and was followed by the 1987 takeover of two British companies. One of them, United Leasing, owned Unilease, the third-largest leasing company in the United States. The process of merging the new subsidiaries with the company's existing IS operations called for substantial restructuring, resulting in the virtual halving of the work force. Inspectorate's leasing operations are now centered in two major regional organizations: The Meridian Group, based in Deerfield, Ill., and Meridian International, which is based outside London.

The revenues of the European operation totaled £480 million ($854 million) in 1988, with pretax earnings amounting to £16.4 million ($29.2 million). That was a higher rate of profitability than expected, considering the costs of restructuring. The company is also looking for substantially higher DP earnings in 1989.

Meridian traditionally specializes in IBM systems, but is now expanding into the market for Digital hardware, with the expectation that Digital will account for a growing share of the computer-leasing market in the coming years. In 1988, Meridian took over another British firm, London-based Electronic Brokers, which is a specialist in Digital leasing.

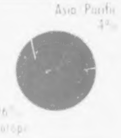
Most of the acquisitions drive is now over, according to Meridian's European management, and 1989 will be a year of building market share. But, if the right company comes along, Rey will still be there with a fistful of Swiss francs to add it to his rapidly growing IS portfolio.

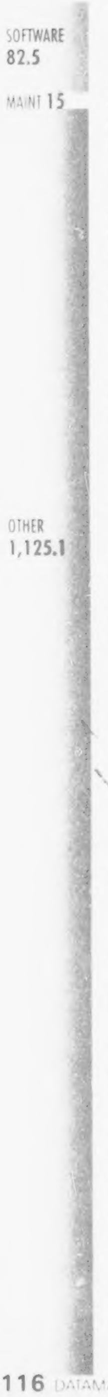
47

Total DP Revenues 1,222.6

SOCIETE GENERALE

Boulevard Haussmann
75009 Paris, France
(33-1) 40-98-20-00





France's largest private sector bank, Société Generale, has two major IS subsidiaries—leasing firm Europe Computer Systemes (ECS) and services company SG2. Together, these subsidiaries achieved a healthy 30% growth in revenues in 1988, with combined revenues of FF7.572 billion ($1.269 billion), compared with FF5.829 billion ($977 million) the year before.

Much of this growth came from the ECS leasing operations, which contributed FF6.8 billion ($1.1 billion) to total revenues—a 24% increase over 1987. Meanwhile, SG2 recorded a modest 7.3% advance to FF781 million ($131 million) from FF728 million ($121.2 million) in 1987.

The buoyant performance of ECS can be attributed in large measure to the decision taken in 1985 to expand into foreign markets. After establishing subsidiaries in Belgium, Britain, Italy, Japan and West Germany in 1986 and 1987, ECS moved into Spain and Switzerland in 1988. Altogether, it now operates 25 branches abroad and 29 in France.

ECS specializes in leasing IBM mainframe and minicomputer systems and, since 1984, PC-level machines from COMPAQ Computer Corp., Groupe Bull and Toshiba Corp. The firm's PC subsidiary, ECS Diffusion, boosted revenues by 70% in 1988, although at FF191 million ($32 million), it still remains a relatively small operation in the ECS hierarchy. ECS also has a maintenance company, ECS Maintenance, and a training subsidiary, ECS Bureautique.

The ECS group diversified its activities further in 1988 by setting up a joint financial subsidiary called Financiere ECS-FIP, in conjunction with a local finance house, to finance leasing for central and local government.

As for the services subsidiary SG2, it has now overcome the turmoil of the mid-1980s, when revenues peaked, profits dived and a strategy of staff cutbacks and restructuring was introduced. Albeit from a smaller base, SG2 is now more profitable than ECS, and although both companies more than doubled their net earnings in 1988, ECS still made only FF49 million ($8.2 million), while SG2's earnings of FF32.4 million ($5.4 million) were 4.1% of revenues, up from 1.75% in 1987.

Like Sligos, the other leading French service company spawned by a big bank, SG2 specializes in banking and financial applications, which account for 60% of its business. SG2 derives 27% of its revenues from its parent company and concentrates its activities in the French market, having established a foreign presence only in Britain, Italy and Spain which together contributed 6% of revenues in 1988.

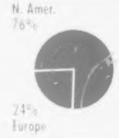
This year, SG2 intends to focus increasing attention on industrial, technical and scientific systems, which currently represent 12% of revenues. It plans to expand its activities in this field by taking over small specialist firms in Europe.

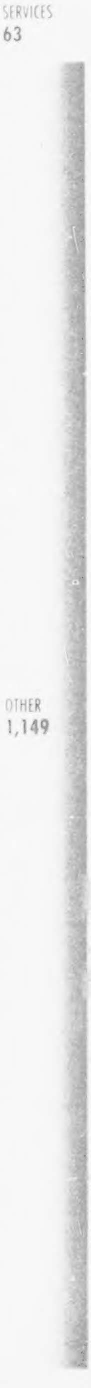
48

Total DP Revenues 1,212

COMDISCO INC.

6111 North River Road
Rosemont, IL 60018
(312) 698-3000





For those concerned with the image of the computer-leasing business, 1988 was a year best forgotten. Writedowns, bankruptcies and low-ball pricing were the order of the day. First, two big leasing companies, both headed by former presidents of the Computer Dealers and Lessors Association, went bankrupt—not the sort of thing that inspires confidence in a poorly understood business. Then came the news that IBM Credit Corp., Big Blue's financing arm, took a $25 million write-down on equipment residual values, confirming to many that IBM spent 1988 buying market share at the expense of profit margins.

At Comdisco, the largest independent lessor, revenues from computer leasing and remarketing rose a paltry 3.5% to $1.15 billion in 1988. What growth Comdisco did see was in strong sales of used equipment and in the leasing of non-IBM computers and data communications equipment. Non-IBM leasing accounted for 50% of Comdisco's leasing business in 1988, up from 40% in 1987. In the years to come, Comdisco executives believe the non-IBM part of the business might become the most profitable.

To counter the tight market at home, Comdisco has devoted more resources to its international business. While European business grew substantially in 1987, it was a different, slower story last year. Revenues for Comdisco's fiscal year ending in September were up only 5% to $215 million in Europe, while losses more than doubled to $11.8 million. Comdisco doesn't expect to see much improvement for at least another year.

The one bright spot is Comdisco Disaster Recovery Services, which continues to see strong growth. Revenues rose more than 45% to $63 million in 1988, and Comdisco added new recovery centers in Canada and the United Kingdom. IBM has announced it will enter the disaster recovery business, and Comdisco is upbeat about IBM's entry, saying the oft-rumored move will help Comdisco's disaster recovery revenues: once again, IBM legitimizes a market just by entering it.

Comdisco's 46.5% increase in the disaster recovery business helped boost its overall IS growth 5.4% to $1.2 billion. Total sales at the company were $1.4 billion with earnings of $96 million, up substantially over 1987 when the stock market crash devastated its risk arbitrage unit. Perhaps wisely, Comdisco is no longer in the equity business.

Comdisco describes itself as a service company, one that goes beyond mere equipment brokering. Comdisco claims it actually helps clients deal with the changing face of information technology. To live up to that ambition, in 1988 it beefed up its marketing force, adding nearly 400 employees, a 33% increase in its work force. Selling, general and administrative expenses increased nearly 30%, despite the relatively flat growth in revenues.

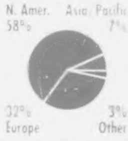
SOFTWARE
40

A Consulting Giant Bets on SI

Despite internal troubles, Arthur Andersen's consulting business has doubled in two years.

49
Total DP Revenues 1.198.5

ARTHUR ANDERSEN & CO.
69 West Washington Street
Chicago, IL 60602
(312) 580-0069



SERVICES
1,158.5

The juggernaut of systems integration (SI) forges ahead, and SI giant Arthur Andersen & Co. says you either drive or you get left behind. Andersen doesn't intend to get left behind.

In a year when overall company revenue increased 20% and almost reached $3 billion, Andersen's IS-related take was up 60% over 1987, hurdling projections to just under $1.2 billion, double the business only two years ago. After a tumultuous year of defections, acquisitions and reorganizations, Andersen sees the rapidly crystallizing systems integration market as the place where it will make its bid for supremacy against fewer and fiercer competitors.

Mel Bergstein, tech czar at Andersen

"Clearly," says John Altman, Andersen's director of worldwide SI practice, "we believe that this is a marketplace that is going to consolidate. Over the next several years, there are going to be very few survivors." Altman, who is also managing partner of the firm's Chicago consulting operations, says "Effective service firms will have to look at their structures to be as effective as we are. We have made the tough decisions, and we're ready now to meet the challenges."

Those tough decisions were made, however, in the face of problems that in 1988 raised doubts about Andersen's long-term viability. As information consulting grew throughout the Big Eight accountancies, consultants became angry at their proportionally diminishing share of profits in key operating decisions. When key partners began leaving to start up rival consultancies, the industry watched for Andersen's reaction. It was swift. The firm split its practice into a tax/audit unit and Andersen Consulting and tied partners' compensation to profitability. That took power away from many top regional managers and left some bad blood between the financial and information sides. But considering revenues of $80,000 per consulting employee and $54,000 per tax/audit employee, there was little else that Andersen could do.

The lure of defection remains, of course. Gresham Brebach, then Andersen's head of domestic consulting operations, was fired in April 1988 for planning to start a rival firm. With several former colleagues, he formed the Information Consulting Group Inc. Altman says such defections will not hurt Andersen. "We haven't had more leave this year than in any previous year," he states.

Mel Bergstein, managing partner for technical competence, adds, "We have a tremendous talent pool that has been built up over decades. We have aggregate experience with jobs in dozens of industries over decades."

The company will turn these resources toward a market that is shaking out some hefty competition. Systems integration—providing for a client's total systems needs, from sourcing hardware to writing software—is seen as the marketing wedge of the future: Digital and IBM are systems integrators. Altman is positive about the development: "What they did added legitimacy to the market." Bergstein, noting that IBM is Andersen's largest consulting client, says, "We would prefer not to compete with IBM. But if we have to, we will."

Such confidence is founded on investment. Bergstein, who oversees R&D activities, the software product business and consultant training, notes that Andersen Consulting nearly doubled its R&D investment to $300 million: $125 million went toward employee education (a whopping $8,000 per person), $100 million to software development, a 50% increase over the previous year, over half of that going to CASE. Bergstein cites two reasons for the big CASE commitment: "Our biggest fear is the combined product and services company. So it's a competitive issue. The second issue is that our clients want standard environments that they can use across their company." He expects 1988's software revenue of $40 million to triple in 1989. ☐

50
Total DP Revenues
1,165.1

NOKIA CORP.

P.O. Box 226
00101 Helsinki
Finland
(358-0) 10711

MAINFRAME	19.1
MINI	65.7
MICRO	337.8
DATACOM	58.1
PERIPH	298.6
SOFTWARE	59.7
SERVICES	35.8
MAINT	167.2
OTHER	123.1

It takes a lot to turn a sluggish Swedish data systems division and a fast-growing Finnish IS subsidiary into a single, vibrant and efficient European company. Kalle Isokallio, the brusque and ambitious president of Nokia Data spent 1988 trying to do just that. But he underestimated the problems and only partially succeeded. "I feel I had a too optimistic and aggressive time scale," he says. "That's only natural."

Nokia Data is the result of a merger between the Data Division of Ericsson Information Systems, a subsidiary of major Scandinavian telecommunications company LM Ericsson, and the IS sales operations of Finnish industrial conglomerate Nokia. Ericsson maintains a 20% stake but Nokia is boss.

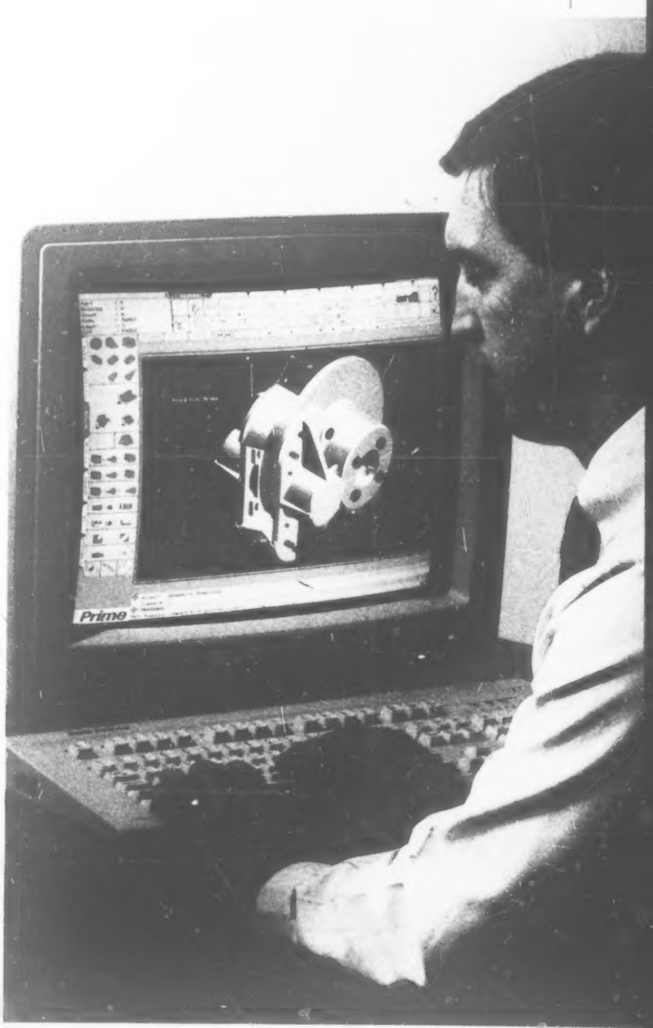
The merger catapulted Nokia Data's IS revenues up 166% to FIM4.9 billion ($1.2 billion). Pretax profits for the Nokia group, however, slumped 11.3% to FIM1.1 billion ($259.7 million) on revenues that had risen 55.8% to FIM22 billion ($5.2 billion). Restructuring Nokia Data took its toll on group profitability.

The firm also suffered from only half the growth rates it had hoped for. "We were looking for 7% and got 3 to 4%," says Isokallio. The new Nokia Data sells primarily terminals, PCs, workstations and workgroup systems. Over 700,000 (broadly defined) professional workstations have been installed. Digital and IBM buy its terminals and monitors for sale in European markets. In Finland it also distributes DPS 8 and DPS 6 systems from France's Groupe Bull, Tandem fault-tolerant machines and some IBM plug-compatible mainframes from National Advanced Systems Corp.

Nokia Data's customer base is predominantly in the banking, insurance, retail and public administration sectors. The West German Bundespost and the Midland Bank in the United Kingdom are among its major customers outside Scandinavia. "One of the reasons we bought the Ericsson operations was for customer base," explains Isokallio. "It can take three to five years just to build a sales network. You'll see a lot more of this. U.S. companies particularly will be buying European companies for their customer base."

Nokia's product development is driven by a combination of networking and ergonomics. These, believes Isokallio, are the keys to IS in the 1990s. "From a users point of view, it is not an OS/2 world or a UNIX world, it's a local area network world," says Isokallio. "We are creating systems that increase the usability of these networks by, for example, connecting UNIX and OS/2 environments. We want to get deeper into the usability of terminal and workstation systems—not just radiation emission levels and physical or software ergonomics—but into the way the systems are used by people. That's what is going to make us different."

Mergers and acquisitions were plentiful in 1988, notably Prime's purchase of Computervision. But the trend among big companies in 1989 may be to take equity stakes in small-frys.



C. ITOH & CO. LTD.

5-1, Kita-Aoyama 2-chome
Minato-ku, Tokyo 107 Japan
(81-3)-497-4141

51 Although C. Itoh & Co. Inc.'s overall revenues dipped slightly last year, this international trading company's IS operations climbed an estimated 15%, rebounding from a decline in the previous year. Nevertheless, despite the growth, IS continues to account for less than 1% of the company's total business.

Last year's IS revenue increase is encouraging C. Itoh to move more aggressively into information systems and telecommunications, despite lacking its own research and development facilities. As a trading company, C. Itoh primarily sells products manufactured by other companies, such as Tokyo Electron Ltd., which manufactures printers sold under the C. Itoh name. C. Itoh's computer family includes fault tolerant computers manufactured by Stratus Computer Inc. and workstations from Sun Microsystems Inc.

As part of its IS expansion, C. Itoh and Nippon Steel jointly established NCI Systems Integration Inc. in April. The venture offers comprehensive programs for planning, constructing, integrating and managing advanced large-scale information-processing systems for domestic Japanese and overseas companies.

NCI sells customized and packaged software, computer hardware and other information processing and telecommunications equipment. Like other systems integrators, such as CSK Group, Computer Sciences Corp. and Electronic Data Systems Corp., NCI claims its consulting and planning services are free from questionable relationships with computer vendors and software companies.

NATIONAL SEMICONDUCTOR CORP.

2900 Semiconductor Drive
Santa Clara, CA 95052
(408)-721-5000

52 A year ago, the DATAMATION 100 reported that National Semiconductor Corp. was flying high. In 1987, bolstered by a broad recovery in semiconductor markets and continued strong demand for its IBM-compatible line of mainframe computers and peripherals, National Semiconductor Corp. had recorded its first profit in over two years.

In 1988, however, National returned to its money-losing ways. Chip bookings were off, the result of another semiconductor market slump, which in part was attributed to softening demand from makers of desktop computer systems.

And this time, the company's National Advanced Systems plug-compatible manufacturer (PCM) systems unit could not offset semiconductor losses. Plagued by product shortages, an unfavorable product cycle period and strong competition from IBM and Amdahl Corp., NAS slumped right along with National's semiconductor business. The result was a company-wide loss of $18.1 million for the year and a decision by National Semiconductor president and chief executive officer Charles E. Spork to get out of the computer business by selling off both NAS and the Datachecker point-of-sale systems division. Those two businesses, which made up the Information Systems Group, had accounted for much of National Semiconductor's revenue growth in recent years. In 1988, the group accounted for just over $1 billion, 38%, of the parent company's $2.7 billion in revenue.

Acer's November 1988 stock flotation was the most popular in the history of the Taiwanese stock exchange; it was oversubscribed 118 times.

After false alarms about a sale to Memorex Telex N.V., National sold NAS to a joint venture of Hitachi Corp. and General Motors Corp.'s unit, Electronic Data Systems Corp. for $398 million in cash. Hitachi/EDS then turned around and said it would sell the European portion of NAS to Comparex Information Systems GmbH, the Mannheim, West Germany, PCM distributor.

CAP GEMINI SOGETI

11 rue de Tilsitt
75017 Paris, France
(33-1)-47-54-50-00

53 Nineteen eighty-eight was Cap Gemini Sogeti's (CGS) first full year after taking control of another large French services company, Société d'Études des Systèmes d'Automation (SESA). The merger resulted in a 39% advance in revenues from 1987, up to FF581.6 billion ($975 million), and a 43.6% surge in net earnings to FF402 million ($67.4 million). Net margins improved from 6.7% to a record 6.9%.

At home, the company devoted its energies to merging the two local operations into Cap SESA, which officially came into existence on January 1, 1989. It is by far the biggest in the CGS group, comprising 17 separate companies and employing 5,000 people. Cap SESA generated revenues of FF2.6 billion ($435.9 million) in 1988, accounting for 46% of the company's total revenues. Other European countries contributed 36%, and the United States provided 18%. CGS claims a services sector market share of about 12% in France and 6.5% elsewhere in Europe. In the United States, revenue was up over 20%, and the group is intent on expanding its 1% share of the U.S. market through further acquisitions.

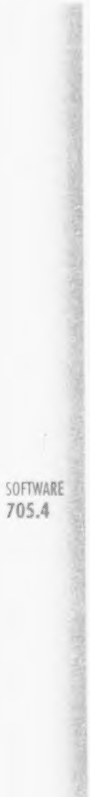
CGS made several takeovers in Europe in 1988, especially in Scandinavia. It paid about FF250 million (around $42 million) for the Swedish service company, Data Logic AB, and bought the small services firm, Hiekkamaki, in Finland.

Elsewhere in Europe, CGS consolidated its operations in Italy and West Germany. The company tried to expand and diversify its British subsidiary beyond the highly specialized sphere of command-and-control systems by buying into Britain's CAP Group early in the year. That attempt failed and, afterwards, CAP merged with France's Sema Metra. However, CGS kept on buying and by the end of the year had built up a 22% stake in the new Sema Group PLC.

And the buying spree isn't over yet. CGS has topped the list of European service companies for many years and is determined to hold onto that position through as many acquisitions as necessary. Meanwhile, the smaller firms are regrouping in preparation for Europe's single market in 1992.

CA Buys Into The Big Time

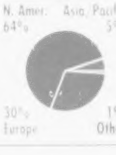
In a year marked by heated mergers and acquisitions in the industry, Computer Associates says internal strengths fueled its real growth.



REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

55
Total DP Revenues 925.3

COMPUTER ASSOCIATES INTERNATIONAL INC.
711 Stewart Avenue
Garden City, NY 11530
(516)-227-3300



Mention mergers and acquisitions to a computer maven, and, doubtless, one of the first names to be spoken will be that of Charles Wang, chairman and CEO of Computer Associates International Inc. Wang has built what some call the "IBM of the software industry" into a marketing behemoth with 1988 revenues of $925.3 million. In 1989, the company should easily soar through the billion-dollar barrier.

Wang built Computer Associates in a very eighties way: he shopped. Since 1986, almost 30 independent software vendors have vanished into CA's carry-all. Among these acquisitions have been such well-known brands as ADR, Integrated Software Systems Inc., Software International Inc., Sorcim and UCCEL Inc. Sanjay Kumar, Computer Associates' senior vice president of planning, says the company's average customer has four CA products, and the average IBM 3090E shop with which it deals has 20 CA products. Given that CA customers number about 30,000—out of the 35,000 to 40,000 IBM mainframe sites worldwide—this, indeed, is market penetration.

Charles Wang, CEO of Computer Associates

In 1988, CA bought the mainframe software vendor ADR, solidifying its position in the data base management system and program-producing market. And even though, Kumar says, CA already owned about two-thirds of the mainframe security market, with two of the three top-selling packages, Top Secret and ACF-2, the company sought a lock on the sector by acquiring Omni-Guard from On-Line Software. In a private deal for a private company—Atrium Interactive Systems of Fairfield, Iowa—CA got Micro Resource Manager for PCs and a problem management/change management product for the Digital VAX. The latter product gives Computer Associates a one-two application punch, joining the firm's existing Netman for the IBM world.

Broadening the world of architectures on which its products can run is a basic piece of Computer Associates' strategy. Wang recently told DATAMATION that software companies, in order to maintain their independence, must provide interfaces and programs that "bridge all the multiple hardware platforms." CA took the first step toward building this bridge in February of 1989, when it announced the CA Application Construction Environment (CAACE), described by the company as a "comprehensive software architecture that provides a framework for application development in the 1990s." The introduction of CAACE has calmed some fears among CA customers through one of its guiding principles, a relational DBMS architecture based on SQL. Other CAACE aims are operating transparency for VSAM, IMS and Total; across IBM mainframes under MVS, VM and VSE; across PCs under DOS and OS/2; and across VMS and UNIX.

To fund developments like CAACE, CA spent $110 million on research and development in 1988. This amounted to nearly 12% of revenues, well above the industry average, which many place at about 7% of revenues. Obviously, Wang's claim that CA has taken a bad rap for stinting on R&D spending is supported by the numbers.

According to Kumar, the public perception that Computer Associates has grown only through acquisitions is also misleading. "Growth without acquisition would have been 30%." Still, the company's growth with acquisition is even more impressive: 1988 revenues were 42.6% higher than 1987's results. Profits were up 136.5% to $142.4 million, proof enough of smart shopping linked with wise marketing.

Nevertheless, not all is smooth in Computer Associates' world. Some customers—particularly users of the ADR linchpin DBMS, now named CA-Datacom/DB—hope that CA's strategies won't derail their own plans, based on longtime, solid relationships with ADR sales and development teams. ☐

COMMODORE
INTERNATIONAL LTD.
1200 Wilson Drive
West Chester, PA 19380
(215)-431-9100

54 Commodore International Ltd. has some peculiar similarities with its better known rival, Apple Computer Inc. Like the Apple II, the Commodore 64 has remained popular years after technology has superseded it. Like the Macintosh, the Commodore Amiga is distinguished by its graphics. Finally, like Apple, Commodore turned to the soft drink industry, specifically PepsiCo Inc., to recruit executive talent with consumer marketing savvy.

But there the similarities end. The Amiga, while widely respected, has been very slow to gather sales momentum. Only now, four years after its first introduction, is it beginning to surpass the sales of the Commodore 64/128 family. And Thomas Rattigan, the former PepsiCo executive who joined Commodore in 1986, lasted only a year. And unlike Apple, which is a PC power because of its sales in its home market, Commodore is almost a nonentity in the United States. With nearly three-fourths of its sales outside the United States, Commodore actually is the most international of any U.S.-based company on the DATAMATION 100 list.

Commodore is a clear leader in the German market and a major factor in Austria, Belgium, Sweden and the Netherlands. Only in Britain and France is it weak. Altogether, Europe accounts for 67% of the company's $926.1 million in PC-related sales, which were up 18% over 1987's levels. The United States accounts for just over one-fourth of Commodore's sales, with Australia and the Far East accounting for the rest. In addition to the Amiga and the 64/128 computers, Commodore offers a line of MS-DOS PCs.

Although the Amiga has struggled to gain credibility in the marketplace, its popularity is increasing, thanks to the growing availability of software. Commodore has Amiga models that appeal to the home and small-business market, as well as to sophisticated users of desktop publishing and animation applications. This year, Commodore plans to announce a 32-bit version of the Amiga with software designed for the German biomedical molecular simulation market.

NORTHERN TELECOM LTD.
3 Robert Speck Parkway,
Mississauga, Canada L4Z 3C8
(416)-897-9000

56 When Northern Telecom Ltd. called 1988 a year of "repositioning," it was describing its decision to take a $200 million write-off for restructuring and setting its new focus on international markets. But the most telling repositioning took place this March in Northern Telecom's executive suite. Paul G. Stern, ex-president of Burroughs Corp. and number 3 man at Unisys Corp. until his abrupt departure in 1987, replaced Edmund B. Fitzgerald as chief executive officer. Recruiting a corporate outsider from the United States whose background is in computers to head an entrenched Canadian telecom company says a lot about Northern Telecom's corporate compass.

Stern inherits a company that has struggled to maintain its presence in the PBX market, but unlike others (notably IBM and Siemens AG), Northern Telecom has managed to be profitable at it. The company's basic strategy has been to position itself as the telecommunications vendor that will work with anyone's equipment. To that end, it has struck alliances with several leading computer manufacturers, most significantly Digital, supporting that company's computer-integrated telephony.

Northern Telecom's $200 million reorganization, which produced a $17.5 million loss in its fourth quarter, closed several plants in Canada and the United States. According to the company, this restructuring reflects the shift in the company's products from hardware to software and its ability to source components from reliable offshore manufacturers. For the year, Northern Telecom reported revenues of $5.1 billion and earnings of $165.6 million. DATAMATION estimates that sales of PBXs, packet-switching equipment and other systems amounted to $900 million. Although sales remained the same as 1987 levels, that's partly a reflection of declining prices and Northern Telecom's sale of its small European data systems group to STC PLC.

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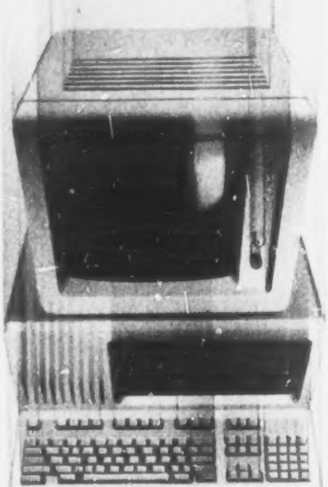

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ECONOCOM INTERNATIONAL BV
1105-BH
Amsterdam Z.O. the Netherlands
(31-20)-97-27-21

57 Fierce competition and the announcement of IBM's AS/400 chopped Econocom International BV's profits back 39% to F20.4 million ($10.3 million) during 1988. Global revenues were up 29.8% to F1.8 billion ($897 million) and in Europe, which accounts for 74% of sales, at Europe's fourth-largest computer leasing company. Profits for its leasing activities were up by 10%. But in the United States and Canada the company recorded a loss of F16 million ($8.1 million) during 1988. The effect of the losses on the company's U.S. strategy has been dramatic. It is now in the process of slashing costs in its U.S. subsidiary by 60% and backing out of the Canadian market in favor of brokerage operations.

During 1988, Econocom's main leasing and trading section grew 26% worldwide to F1.6 billion ($823.5 million), which includes nine months of revenues from Econocom France and Ordineco. Econocom increased its stake in these two French leasing companies to 100% in the early part of the year.

Meanwhile, the company's maintenance business shot up by 50% to F47 million ($23.8 million), its consultancy division revenues (based on consultancy, software and training) soared to F25.4 million ($12.8 million) from F3.8 million ($1.9 million), and the company's microcomputer sales jumped by over 100% to F73 million ($37 million). The Ecofinance International group, which concentrates on financing services, isn't measured in the revenues but added F9.7 million ($4.9 million) to profits. These activities were expanded by Econocom's purchase of major stakes in French microcomputing companies RSB and Sofigo and French consultancy Expert France, and a 97% stake in French maintenance firm MAT.

STORAGE TECHNOLOGY CORP.
2270 S. 88th Street
Louisville, CO 80028
(303)-673-5151

58 Uncomfortably accustomed to being the focus of grim news, Storage Technology Corp. is quietly and handily going about its business. Revenues reached $874 million in 1988, the highest mark since 1983, the year before StorageTek filed for Chapter 11 bankruptcy protection. The 16.5% increase over 1987's $750 million is the third increase in a row, each gain larger than the last.

Drastic measures were taken when StorageTek got into trouble early this decade. Founder Jesse Aweida stepped down in favor of corporate turnaround artist Ryal Poppa, half the employees were fired and the expensive and overreaching optical storage project was cut. Following its Chapter 11 reorganization, StorageTek distributed 193 million shares of stock to settle its debts. Those new stockholders will be happy to know the results of these efforts: a tangible profit for 1988 of $44.2 million—1987's profit of $26 million had been negated by a retroactive extraordinary charge related to the bankruptcy proceedings.

Now, with a stable of reliable products, StorageTek is poised to take advantage of resurging customer confidence. Tape products bounced back as the biggest contributor to revenues last year. The 4480 sold very well to customers moving up from the old nine-track 4670, and the Automated Cartridge System (ACS) tape library went from being a drawing-board gamble to a certified money-maker.

Direct access storage device (DASD) product sales were down, due mostly to the company's inability to get its triple-capacity 8380-3X out the door until January 1989. Printer sales were flat. A decline in service revenues was attributed by the company to old machines being replaced by more reliable ones and to being forced to match IBM's maintenance cost cuts.

AMSTRAD PLC
Brentwood House
169 King's Road
Brentwood, Essex CM14 4EF. U.K.
(44-227)-228888

59 The PC clone business is a volatile one. Everything depends on moving product—lots of it—and whatever slows that process down immediately hurts growth.

That was Amstrad PLC's lament for 1988. Badly hit by the memory chip shortage, the British personal computer company lost sales by being unable to produce sufficient volume for the market. On top of that pressure, production of Amstrad's new PC 2000 models, based on the Intel Corp. 80386 and 80286 microprocessors, was delayed until the first quarter of this year by various development crises. Meanwhile, over in Germany, the company's former distributor dumped its remaining inventory on the market, negating Amstrad's marketing efforts.

These problems ate into profits, which were down 12% from 1987, to £92.8 million ($165 million). Total revenues were up 6% to £623.1 million ($1.1 billion). IS revenues also rose 6% to £473 million ($841 million).

According to the Paris-based market research firm Intelligent Electronics, in terms of unit shipments, Amstrad had a 3.4% share of the European PC market in 1988. The company's largest share came from Britain, with 13.6%, or 778,000 units. Unit sales of 787,000 in France exceeded those in Britain, but market share there was lower, at 8.4%. In Italy, where Amstrad has a 3.4% share, 467,000 units were shipped.

Amstrad's status was also elevated above that of a mere clone-maker last July, when chairman Alan Sugar signed a deal with IBM providing each company with access to the other's patents. This should help sidestep any copyright disputes that may arise.

INTERGRAPH CORP.
1 Madison Industrial Park
Huntsville, AL 35807
(205)-772-2000

60 When the computer-aided design, manufacturing and engineering market soared between 1982 and 1984, Intergraph Corp. became a highflier selling VAX-based host systems enhanced with its own graphics processors and software. Then the market cooled, and customers demanded less expensive workstation and PC-based solutions. Intergraph had to scramble.

Intergraph had debuted its workstation strategy in 1985: a line of Clipper workstations based on reduced instruction set computer architecture. When a shortage of RISC chip sets threatened sales in 1987, Intergraph took the controversial step of acquiring the supplier, the Advanced Processor Division of Fairchild Semiconductor Corp.

In 1988, Intergraph's workstation strategy paid off. Total company sales rose 24.8% to $800.2 million, and profits were up 25.9% to $88 million—a stark contrast to 1987, when sales were flat and profits actually fell. A lackluster fourth quarter, caused by softness in non-U.S. sales, was the only drag on an otherwise successful year.

Intergraph introduced a second-generation RISC microprocessor in 1988 and expanded its workstation line with a 27-inch, 2 megapixel workstation. Now virtually every system Intergraph sells includes at least one Clipper workstation, with growth in workstation sales far outstripping growth rates in VAXs. The high level of Intergraph content in the workstations helps keep the margins healthy.

Seagate's fourth-quarter
layoff of 1,800 workers will
save it $35 million a year

Intergraph has also been busy on the software front and now offers a pair of UNIX-based software environments. One was developed internally for high-end applications. The other for less complex applications is from Bentley Systems (in which Intergraph has a 50% equity stake) and is a virtual clone of Intergraph's VAX-based IGDS. Intergraph is also developing a new generation of UNIX-based applications in the C language. While just over half of its software revenues are still VAX-related, the VAX share continues to drop in favor of UNIX.

MOTOROLA INC.
Motorola Center
1303 East Algonquin Road
Schaumburg, IL 60196
(312)-397-5000

61 Motorola Inc. celebrated its 60th year in 1988, and the celebration seemed never to end. Its sales were at a record $8.25 billion, a 23% increase over the year before, while profits increased nearly 45% to $445 million, a record. Its biggest operations—communications products, semi-

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conductors and general systems products—each posted profit increases of 10%. Motorola's information systems operation, which includes Codex Corp. and Universal Data Systems Inc., turned in a hefty 12% increase in profits, although market factors were working against that operation.

Last spring, Motorola's semiconductor operations introduced a high-powered reduced instruction set computer (RISC) chip, the 88000. And last March, Motorola surprised the industry by unveiling its own 88000-based computer workstation family, called the Delta Series 8000. The company is now competing with its own customers who use Motorola chips in their workstations.

The computer group, which is part of Motorola's General Systems Group, introduced its first RISC VME board-level computer. The group also completed agreements with software companies to market two products to bridge the UNIX and MS-DOS worlds: programs that convert MS-DOS programs into UNIX programs and an emulator that resides on UNIX platforms and emulates IBM PCs.

Although Information Systems Group sales rose 7% to $566 million, price erosion in the modem market caused its Codex operation to scale down expenses. Universal Data Systems added several new products to the data communications line, including new micro-to-mainframe products. DATAMATION estimates that total sales of computers, modems and other communications products at Motorola increased just over 9% to $790 million.

ALPS ELECTRIC CO. LTD
1-6, Yukigaya ohtsuka-cho
Ohta-ku, Tokyo 145
(81-03) 726-1211

62 Although Alps Electric Co. Ltd. entered information processing through the back door of components, the firm is now concentrating its efforts on printers and peripherals, with mouse input devices and disk drives receiving most of its attention. But Alps' performance has been unexpectedly hurt. Its profitability declined because of lowered export values dampended by unfavorable foreign exchange rates. Furthermore, continued price cuts demanded by domestic customers are undercutting gains in IS sales.

Nevertheless, gains in IS revenues offset declines in Alps' other lines, rising 10% to ¥100.6 billion ($785.2 million). Overall sales declined slightly to ¥380.7 billion ($3 billion). Net income was down 27.5% to ¥5.4 billion ($42.1 million).

To address these difficulties, Alps is stepping up its already aggressive overseas production expansion and plans to advance into Southeast Asia, targeting Malaysia or Thailand as promising bases of operation. The company is also considering Brazil. Alps Electric Europe in West Germany is building a new ¥3.4 billion ($26.5 million) plant. In California, Alps Electric (U.S.A.) Inc. is expanding its activity, which includes components imported from Japan, as well as locally manufactured floppy disk drives, boards and mouse input devices.

Alps is the world's largest independent supplier of floppy disk drives, and its sales of hard disk drives are approaching those of the company's floppys in production value. Research and development programs are focusing on information storage systems based on optical disks and other high-density media.

The banking market makes up 35% of the revenues of Olivetti Systems and Networks.

MANNESMANN AG
Mannesmann Ufer 2
4000 Dusseldorf 1, West Germany
(49-211)-8201

63 West Germany's third-largest computer company, Mannesmann AG, spent much of last year reorganizing itself into more flexible, independent business divisions that can react faster to customer demands. The restructuring split the group into Kienzle Computer Systems; Kienzle AUTOCOM (Automobile & Communication); PCS Computer Systems; Mannesmann Tally (printers); and Scangraphic (editing and layout systems), a division built around systems company Alfa System Partner GmbH, which Mannesmann acquired last year.

Revenues were up 12% to DM1.6 billion ($911 million). This increase included a healthy 21% jump in sales in the new Computer Systems Division, as well as help from the financial, retail fuel and public authority sectors.

The company continued to target its traditional midsized customers, putting a strong emphasis on the 9000 family of business systems. In December of 1988, Mannesmann celebrated its 20,000th sale of the product.

On more unfamiliar ground, Mannesmann launched itself into the telecommunications arena last year with fax machines and computer and telephone products, in preparation for the imminent introduction of full Integrated Services Digital Network (ISDN) services in Europe.

The company also made an effort to increase its pan-European business with a new Belgian subsidiary, Mannesmann Information Technology, and by cultivating major orders from banks and fuel retailers in Spain and the Yugoslavian telecom authority. Back home, Mannesmann teamed up with IBM Deutschland to offer a complete publishing solution based on software from its Alfa Control subsidiary and IBM hardware. The first joint deal is to equip Rheinisch Bergische Presse Data GmbH with a 300-workstation system.

MARTIN MARIETTA CORP.
6801 Rockledge Drive
Bethesda, MD 20817
(301)-897-6000

65 For Martin Marietta Corp. and its Information Systems Group (ISG), 1988 looked like success. Corporate revenue was up by nearly 6% to $5.73 billion, and profits were up by more than half, reaching $358.9 million. Not counting sales to other Martin Marietta divisions, the ISG saw revenue increase 8.4% to $743.4 million and profits quadruple to $213.7 million. But take away the $194.6 million one-time sale of the ISG's successful British subsidiary, Hoskyns Group PLC, and you're left with flat IS profits. Besides, a growth rate of less than 10% in the systems integration business is cause for concern.

Early in the year, Martin Marietta won a five-year, half-billion-dollar deal to develop and operate the National Test Bed, a sophisticated computer simulation network for testing and evaluating defense systems for the Strategic Defense Initiative. It's the biggest SDI contract ever awarded and certainly looked to be worth billions more to the corporation when research turned into development. But

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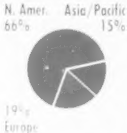


MAINFRAME
632.9

MAINT
123.4

REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

Never averse to a bit of glitzy publicity, Cray Research Inc. stitched up a gown made of computer chips to adorn the body of Miss Minnesota at the Miss U.S.A. pageant this year. If that's what became of those defective gallium arsenide chips from the Cray-3, it was one expensive gown: last October, Cray took a $10 million write-off on the faulty chips for the still-in-development supercomputer.

Cray isn't used to failing to develop what it wants to. Cray's longtime habit of investing 15% of revenues in research and development continues to pay off in marketplace success. Bob Ewald, Cray's executive vice president of software, puts it this way: "Fifteen percent is what it took early on, and it still takes 15% to fund existing hardware and software research." In 1988, Cray's 15% R&D habit meant the company spent about $118 million.

Bob Ewald, executive VP of software at Cray

Pleased by the results of past R&D, Cray stockholders aren't always as thrilled by current R&D expenditures. The company's policy of not paying dividends and rolling the money over for future payoffs instead is questioned at every annual meeting. But Ewald states the corporate policy simply: "In an industry that's really expanding, we feel we're better off—can provide a better return to investors—by putting an appropriate amount of money into R&D."

But this year could see a significant R&D shift for Cray. Providing that the final work on the Cray-3 doesn't raise the ante in hardware dollars, 1989 will be the first year in which Cray invests equally in software and hardware. Until recently, Cray believed the major performance improvements lay in hardware. Now software receives equal attention. Says Ewald, "It's a recognition that software is as important as hardware in carrying the business forward."

Ewald reels off a list of the forces that are increasing the software R&D budget: "The need to connect to so many more environments today—workstations, networks, computers—to support different compilers, to recognize users' FORTRAN and C programs." In addition, he says "The nature of scientific computing is changing. It's a broader business than it used to be. It's not a networking business yet, but it's getting there."

Last year, Cray unveiled a parallel-processing FORTRAN compiler for its X-MP and Y-MP machines. Some applications reportedly saw an eightfold speed increase when ported to the eight-processor Y-MP. The other major software project getting R&D funds is an enhancement of UNICOS, the UNIX-based operating system that will, at the software level, marry the number and letter lines. Last year, 35 of 53 Cray machines were shipped with UNICOS.

Despite the bad-chip write-off, Cray managed to hit its yearly earnings projections: $156.6 million, up 6% from 1987, on revenues of $756.3 million, up 10% from $687.3 million in 1987. But Cray hit its target only after a record fourth quarter in which it installed 29 systems (10 more than the previous high in the first quarter of 1987), and only after twice downsizing its 1988 earnings forecast.

In mid-May 1989, in order to maintain twin R&D efforts, one for the Cray-3, the other for the C-90, which is a follow on for the Y-MP, Cray announced it would split itself in two. In an extraordinary move, Seymour Cray, founder of Cray Research, will instead head Cray Computer in Colorado Springs, Colo. The new company will be financed by up to $100 million in cash over the next two years, plus about $50 million in equipment, facilities and inventory. Current Cray Research stockholders will own 90% of the new company; Cray Research will hold 10%. Cray Computer will concentrate on developing the gallium-arsenide based Cray-3, now targeted for 1990 or 1991 delivery. The parent company will focus on increasing earnings by evolving current Cray technology. ▭

Washington waters have turned chilly for Star Wars, and warm expectations are cooling. Also a disappointment was the loss in a bidding war of a contract for the massive upgrade of the federal telecommunications system known as FTS 2000. Originally up against incumbent AT&T, Martin Marietta saw the deal go from a winner-take-all format to a 60–40 split. The company was already thinking about how it would spend the $20 billion or so it expected to realize, when Sprint entered the competition late in the game and took Martin Marietta's share.

In 1988, Martin Marietta actually decreased its research and development budget 11.4% from the previous year to $194.9 million. That's 3.4% of revenues, the lowest percentage since 1983.

CONTINENTAL INFORMATION
SYSTEMS CORP.
1 CIS Parkway
Syracuse, NY 13221
(315)-437-1900

67 Don't ask Harry Goetzmann about hostile takeovers. Continental Information Systems Corp.'s chairman and chief executive officer put his computer-leasing company on the map in 1987 with the unfriendly buy-out of a top rival, CMI Corp. of Bloomfield Hills, Mich. One of many consolidations in the computer-leasing market following the 1986 Tax Reform Act, the buyout made Continental the second largest U.S. computer-leasing firm. It also helped drive the company toward Chapter 11 bankruptcy proceedings.

Just about everything that could go wrong with the CMI acquisition did. Things got ugly when four CMI executives bolted to form another leasing firm, Encore International, taking hundreds of CMI employees and some top accounts along with them.

The merger became an operational nightmare. The computer and accounting systems of the two firms proved incompatible, forcing Continental to keep hundreds of employees working overtime straightening out accounts. Administrative costs went through the roof, and the company became so distracted it seemed to lose a grip on its business.

Continental found itself writing more operating and direct-financed leases, replacing the tax-shelter-based leases that were made obsolete by tax reform. Unlike a tax-shelter-based lease, in which most of the profits are realized at the beginning of the lease, operating or direct-financed leases do not provide a big payout until the lease is up—typically four years.

With a punishing debt load, a parched cash flow and heavy takeover expenses, Continental ran at a loss throughout all of 1988. Banks withdrew their credit lines, and customers shied away. Incredibly, in August, Prudential Insurance Cos. agreed to refinance the takeover debt, but it wasn't enough to stem the tide. As the stock slid from $3 a share to $2 in December, Goetzmann publicly denied rumors of bankruptcy while searching feverishly behind the scenes for a buyer or a cash-rich partner. In January, the company announced it could not make the $3.8 million interest payment due Prudential and said that had filed a petition for reorganization and protection under the Chapter 11 bankruptcy provision. First Boston Corp. is helping to find a buyer.

A third of Intergraph's sales are made in the European market.

GENERAL ELECTRIC CO.
3135 Easton Turnpike
Fairfield, CT 06431
(203)-372-2211

68 So what happens when the company president gets dumped and is replaced by the guy who used to be the senior vice president? It turns into a very good year, of course. "It wasn't a big deal for most employees," says GE Information Services president James McNerney Jr., who took over in September after Anthony Craig was abruptly made a "consultant" to GE vice chairman Lawrence Bossidy. A month after McNerney replaced him, Craig surfaced as executive vice president and chief operating officer of Prime Computer Inc. He later became president and chief executive officer.

Although its financial results and those of other GE individual business units are guarded as if they were nuclear war codes, both GE Information Services' net income and revenue rose approximately 10%. Revenues were just shy of $500 million. U.S. income, which for the last few years had been in the pits while the company struggled through the metamorphosis from a time-sharing vendor to a network service provider, soared dramatically and now equals overseas income.

The U.S. comeback was primarily due to MIS acceptance of GE Information Services in the role of intercompany network provider and in-house integrator rather than as a potentially threatening alternative to MIS operations. That self-portrayal will continue this year as the company focuses on deepening its vertical markets in core businesses such as high-tech manufacturing, banking and trade/transportation.

That role will be mirrored, perhaps even more successfully, internationally. As a purveyor of what it claims is the world's largest commercially available teleprocessing network, GE Information Systems has long been strong in Europe. "We're better positioned than anyone else in the world to take advantage of international growth," McNerney claims. "The big story right now is Europe '92. We've always been perceived as a European company in Europe, and that's key to doing business there.

"The rest of the world is scrambling to catch up with us. They're ready to do any deal. But I'm ready to do the *right* deal because I'm already there. I'm feeling very well positioned right now."

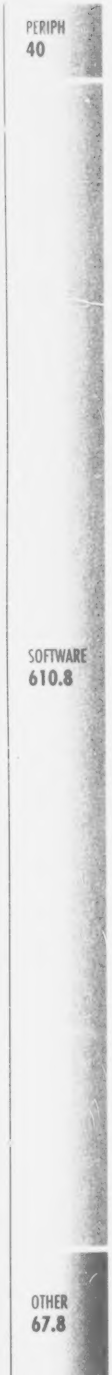
CSK GROUP
Shinjuku Sumitomo Bldg. 6-1,
Nishi-Shinjuku 2-chome
Shinjuku-ku, Tokyo 163, Japan
(81-3) 344-1811

69 Last year, CSK Group joined a growing wave of companies aiming to make the systems integration business a key part of their future. Continuing its transformation from a supplier of contract programmers to a full systems development and management services organization, CSK created a new organization to focus on system integration.

The organization, called CSK Systems Integration Services Division, was formed in October. The operation absorbs the bulk of CSK's existing IS businesses. Last year, revenues from these

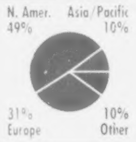
New Conquests for The MS-DOS Master

A broader product line puts Microsoft's eggs in several software baskets.



66
Total DP Revenues 718.6

MICROSOFT CORP.
16011 N.E. 36th Way
Redmond, WA 98073
(206)-882-8080



When Intel Corp. announced its latest milestone microprocessor, the 80486, there on the dais demonstrating the speed and power of the new chip on a PC was William H. Gates, chairman and chief executive officer of Microsoft Corp. Lately, Gates' presence has seemed a required imprimatur for important PC product announcements. Since the day Microsoft's PC operating system, MS-DOS, was chosen for Big Blue's PCs, Microsoft has worn a cloak of power few other offspring of the PC explosion have found fitting.

Bill Gates, founder and CEO of Microsoft

Microsoft has fought for its independence, stepping out of IBM's shadow—and making good profits—with Macintosh applications software. At the same time, Microsoft has cultivated its own DOS and OS/2 backvards. These moves have brought the company to the top of the PC software field. Last year, Microsoft's revenues grew 57.3% to $718.6 million. Profits climbed 62.8% to $151.4 million.

Over the past year, Microsoft has been busy introducing OS/2 to the corporate world, preaching the virtues that its new PC operating system has over the current DOS operating system. At the same time, it has been pushing its Windows operating system, a sort of halfway house for DOS users not yet ready to move to OS/2. Windows had a slow start but, Gates told a recent seminar, "Windows has really taken off for us."

Windows' graphical user interface has been the key to the company's recent fortunes, according to Scott D. Oki, senior vice president for domestic sales and marketing. "Graphical applications have really been the strength behind sales of application software this year," he says.

Like its home state of Washington, Microsoft has become known for its apples—in this case, software for Apple Computer Inc.'s PCs. Microsoft had invested in the market early, in 1985, while Apple's Macintosh computer still seemed to be forbidden fruit to many software developers. "We invested in the Macintosh early on," Oki points out, "and it has paid off. We're the number 1 software company for Macintosh products." Microsoft has three of the best-selling programs on the Mac: Excel, a spreadsheet package; Word, a word-processing program; and Works, an integrated software package. The Mac work has given Microsoft's vast army of programmers experience with graphical environments in Windows and OS/2 operating system environments.

Microsoft's greatest success may also have a vulnerable spot: last year, Apple sued Microsoft, along with Hewlett-Packard Co., over the graphical user interface the two developed for HP's New Wave interface. The court battle could take some time to sort itself out and may eventually have an unsettling effect on software development.

Even with dollars pouring in from DOS, OS/2 and Macintosh applications and operating systems, Microsoft is hedging its bets. In February 1989, the company purchased a stake in its longtime UNIX partner, The Santa Cruz Operation Inc. The agreement calls for the two companies to continue their work to bring graphical applications—such as OS2's Presentation Manager—to the UNIX environment. Microsoft has denied steadfastly that its investment in the UNIX-oriented company represents any danger to the success of OS/2. "We see distinct roles for OS/2 and UNIX in the future," Oki says.

Like many others in the PC software business, Microsoft has been bitten by the delayed-shipping bug. In this case, delays have occurred with two of the company's most popular applications software items, Microsoft Word 4.0 for the Macintosh and Microsoft Word 5.0 for the DOS world. Microsoft was expected to have the products ready by January 1989, but then rescheduled shipping for April. The announcement put a blemish on Microsoft's formerly spotless record. ☐

businesses increased 36% to ¥84.6 billion, accounting for nearly two-thirds of the company's overall business.

Revenues from computer services, including contract programming, grew 20%, while revenues from facilities management and allied operations rose 21%. During the year, CSK saw strong returns result from a recent emphasis on developing systems for finance and distribution industries. For example, business from financial customers rose 35% as a result of a concentration on on-line financial systems. In distribution systems, new efforts will focus on advanced point of sale and electronic-ordering systems.

In 1988, growth in CSK's minicomputer and microcomputer sales were strong, but mainframe sales lost ground. An IBM Japan sales representative, CSK registered a 42% increase in revenues from the sale of IBM-manufactured small and medium-sized computers. Software sales and computer services revenues rose, while income from maintenance and leasing operations remained at the same level as in 1987. CSK also established a joint software development venture with IBM Japan.

BELL ATLANTIC CORP.
1600 Market Street
Philadelphia, PA 19103
(215)-963-6000

70 Bell Atlantic Corp.'s struggle to become a mover and shaker in the information business gets better reviews than some of its fellow Bell operating companies. The company has made a string of acquisitions in computer maintenance and leasing, while running a tight shop in its basic phone business. Although 1988 revenues were basically flat at $10.9 billion, net income grew 6% to $1.3 billion.

Bell Atlantic's Caller ID is a system that lets you see who's calling before you pick up the receiver. The company has said that Caller ID is the kind of cutting-edge service that makes being a local phone company fun and exciting. Civil libertarians have called Caller ID a clear invasion of the caller's privacy: it's your business, they say, from where you make your calls. The Consumer Advocate in Pennsylvania filed a complaint trying to stop the service.

In the midst of defending Caller ID, Bell Atlantic found itself in a controversy over its gateway service, which allows users of PCs to hook up to information services. Judge Harold Greene gave the green light to gateway services in 1988, but then declared that Bell Atlantic's decision to provide the service in Pennsylvania, using just one computer—instead of one in each area code—made it an information service, which the company is barred from providing.

In 1988, 11% of Sun's workstation sales were to nontechnical users.

Less controversial were Bell Atlantic's moves to expand its computer maintenance and leasing business, which accounted for some $657 million in revenues in 1988. Four years ago, Bell Atlantic bought Sorbus Inc., the big third-party maintenance firm. But the maintenance market in the United States has tightened up since then. So, Bell Atlantic has branched out into Europe and Canada and has also acquired several small companies that provide self-maintenance service, a fast-growing niche of the maintenance business, in which users maintaining their own equipment are supported by Bell through carry-in repair and parts supply service.

APOLLO COMPUTER INC.
330 Billerica Road
Chelmsford, MA 01824
(508)-256-6600

71 Fierce competition and a strategic miscalculation savaged 1988 profits, as this pioneer workstation maker sought to keep pace with competitors. Earnings plummeted to $2.1 million from 1987's $20.5 million in the wake of a spring pricing offensive targeting rivals Digital, Hewlett-Packard Co. and Sun Microsystems Inc.

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The cuts reduced the price of some workstations by 35%. As a result, in April of 1989, the suddenly vulnerable Apollo Computer Inc. was acquired by Hewlett-Packard for between $500 million and $600 million. The combined unit will control the second-largest hunk of the workstation market—between 27% and 30%, depending on the analyst doing the guesswork.

Apollo, which traditionally occupied first or second place among workstation supplier ranks, had fallen to fourth place in 1988. The pricing strategy certainly aided sales, which rose 18% to $653.5 million for the year. But rather than returning Apollo to the top of the workstation maker ranks, the bargain prices further clouded its long-term outlook and made the company vulnerable to raiders.

The extent of the miscalculation surfaced as Apollo president Roland D. Pampel resigned in the wake of a second-quarter loss. His departure returned Apollo chairman Thomas A. Vanderslice to double duty as president and chief executive officer.

Apollo began the year with its sights set on the profit-rich high-performance workstation market, not on price cutting. It launched a reduced instruction set computing (RISC) product line called the Domain 10000. Joined by a pair of Motorola Inc. 68030-based workstations, the unveilings gave the company's products solid footing at the performance apex of their classes.

Revenues from Europe and Asia/Pacific rose to $372.5 million, or 57% of sales, up from $287.8 million. The biggest revenue gains were posted in Asia/Pacific, a market that now accounts for 19% of sales.

LOCKHEED CORP.
4500 Park Granada Boulevard
Calabasas, CA 91399
(818)-712-2000

72 After just a few years in the information business, Lockheed Corp. wants out. Worried over the post-Reagan era of tighter defense budgets and a possible takeover, Lockheed has decided to concentrate on getting whatever is still to be got from the Pentagon. As part of a reorganization announced in April, Lockheed put four of its main information businesses—CADAM, CalComp, Lockheed Dataplan and Metier—on the block.

Lockheed began its retreat from the information business in 1988 by selling its Dialog Information Services to Knight-Ridder. The four companies now up for sale accounted for 95% of Lockheed's IS revenues in 1988. CalComp, which came to Lockheed in 1986 through the acquisition of Sanders Associates Inc., saw revenues of $450 million last year. Despite fierce price cutting in the market for plotters, displays and digitizers, demand for these products showed steady growth among architects and designers, enabling CalComp to post a 22% increase in sales.

CADAM won status as a preferred vendor to General Motors Corp. for its enormous C-3 CAD/CAM/CAE development effort. CADAM posted a 24% increase in sales. Metier, the leading provider of project management software, extended its reach into the VAX market and also formed an alliance with Symantic of Cupertino, Calif., which sells the TimeLine project management package for personal computers. Metier's sales were up 9% to $100 million.

Lockheed is also selling its small Lockheed Dataplan business, which provides flight-planning and weather services, but it is holding on to Datacom Systems Corp., of Teaneck, N.J., which supplies computer services to state and local governments.

COMPAREX INFORMATIONS SYSTEME GMBH
Gottlieb-Daimler-Strasse 10
D-6800 Mannheim 1, West Germany
(49-621)-40090

73 After a year of merger consolidation, Europe's leading plug-compatible manufacturer (PCM), Comparex Informationssysteme GmbH, concentrated on establishing its own identity and strengthening its operations across the Continent in 1988.

Formed by the merger of the PCM operations of West Germany's BASF Group and Siemens AG in early 1987, Comparex inherited a strong dependence on the German market for its revenues. This could become an unhealthy dependence in the advance toward a single European market in 1992. Therefore, the firm's management is eager to achieve a better

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balance of sales across European countries.

Last year's revenues of DM1 billion ($569 million), were up by 13% over 1987's figures. About half of that total came from the company's home market in Germany, but growth rates were higher in Comparex's other major European markets in Britain, France, Italy and Spain.

Outside Europe, the company picked up another 17% of revenues from the Middle East and Africa, especially South Africa, where the company distributes Hitachi Ltd. processors via local agent Persetel.

To keep pace with its European expansion, Comparex hired 8% more people last year, bringing the total work force to 1,127—642 in West Germany and 485 in the firm's subsidiaries. Much of this increase was in the areas of consultancy, systems and user software support, technical support and training—part of a company strategy to avoid becoming just another hardware supplier. In fact, since its expansion into in-house systems engineering and performance management services last year, nearly two-thirds of Comparex's personnel now work in customer support groups.

The company's expansion across Europe is far from over. It plans to complete the acquisition of the European operations of National Advanced Systems in the next few months—but still maintains that with or without this business, it expects to double 1988's growth this year.

MINISCRIBE CORP.
1861 Lefthand Circle
Longmont, CO 80501
(303)-651-6000

74 As late as Thanksgiving of 1988, Miniscribe Corp. executives were projecting rosy year-end results. A week later, they hoisted storm warnings, followed shortly by a full-scale SOS. Within three months, president Q.T. Wiles was out, and Miniscribe was in the hands of turnaround specialist Richard Rifenburgh. The company reported a $14.6 million loss in the fourth quarter.

Miniscribe seems to be a victim of that deadly double-bind: over-optimism and excessive denial. In the face of what was clearly slumping demand, Miniscribe kept pumping out disk drives, allowing both its accounts receivables and inventories to balloon. By the end of the year, the ratio of inventory to sales was 43% (the industry norm is 24%), while accounts receivables were at 122 days—far above the industry average of about 70 days.

Even without the slowdown in demand, Miniscribe was facing a difficult transition away from its mainstay 5¼-inch disk drives. The company was already behind with its new generation of 40 megabyte 3½-inch disk drives, and it was cutting back on research and development spending.

Under Wiles' stewardship, beginning in 1985, Miniscribe grew phenomenally. Rifenburgh, who honed his turnaround skills at Oxoco and GCA Corp., is a partner with Wiles at Hambrecht & Quist Investment Partners. One of his first actions was to announce that Miniscribe will restate its 1988 results (earnings of $25.9 million on sales of $603.3 million) and probably its 1987 figures, as well. He also began cutting overhead, eliminating some 2,350 jobs—mostly in Singapore and Hong Kong, but several hundred at the Colorado headquarters, as well.

MINNESOTA MINING AND
MANUFACTURING CO.
3M Center
St. Paul, MN 55144
(612)-733-1110

75 3M reached two magic milestones in 1988: $10 billion in total sales and over $1 billion in profits. Data products are just a tiny piece of that $10 billion pie. 3M is really one small business after another—45 different product groups using some 111 technologies. In a time of leveraged buyouts and corporate restructurings, 3M gets high marks from analysts for taking the long view of things, investing in internal growth and very selective acquisitions. 3M plowed $650 million into R&D in 1988.

The mainstay of 3M's Data Storage Products Division is the ¼-inch tape cartridge, a product 3M invented in the early 1970s that is now coming into its own as the backup medium of choice for small and midrange systems. Santa Clara Consulting Group estimates that data cartridges account for nearly half of the

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company's $563 million in sales of magnetic media products, up nearly 24% over 1987's figures. 3M virtually owns the cartridge market, controlling market share and technology. 3M has developed a cartridge that stores 320 megabytes of data and has promised to deliver a 1 gigabyte cartridge within two years.

3M has extended its IS reach beyond just magnetic media. In 1987, it acquired the HELP hospital information management software from Control Data Corp. and now has a VAR agreement to market the system on hardware from Tandem Computers Inc.

3M is also pursuing image processing. Through its newly formed Document Systems Division, 3M sells the FileNet Workflo image-processing software. 3M also has a stake in EOTEC Corp., a West Haven, Conn., company that specializes in fiber optic sensing systems, a $100 million niche market in the burgeoning fiber optics field.

TEXAS INSTRUMENTS INC.

13510 North Central Expressway
Dallas, TX 75243
(214)-995-2011

76 In a replay of 1987, Texas Instruments Inc. made more money from suing copycats than it did from selling computer systems and software. Royalty payments following patent infringement suits against eight Japanese chip makers and one Korean supplier swelled TI's coffers by $124 million last year. Which is just as well: TI's Digital Products Group, which includes the firm's IS business, as well as calculators, industrial control systems and hearing aids, lost money for the second year in a row. Last year's loss of $53 million—greater than 1987's $28 million loss—took place as the chip maker experimented with a new strategy that emphasizes AI-based software more than "me too" minis and other hardware. TI's IS revenues of $577 million were about flat with 1987's figures and provided only 9% of the company's total business.

Leadership in technology was the keynote of the Dallas chip maker's year. TI celebrated the 30th anniversary of its invention of the integrated circuit by announcing its invention of a new kind of IC. The company revealed its quantum-tunneling transistor, which is 100 times smaller and 1,000 times faster than current devices. It is targeted for commercial chips in the mid-1990s, TI says. Booming worldwide semiconductor markets also provided a reason to celebrate: TI's net sales grew 13% to $6.3 billion, and net income jumped to $366 million.

The company is trying to translate technological leadership in other operational areas into products and services that will offset the perilous cyclical nature of the chip business. TI, by consensus, has one of the most sophisticated internal IS shops in the world, as well as one of the best global computer networks. Pioneering work in electronic data interchange (EDI) has been one offshoot, which is now being augmented by consulting, network services and software to customers and suppliers.

RACAL ELECTRONICS PLC

Western Road
Bracknell, Berkshire RG12 1RG, U.K.
(44-344)-481222

77 Nineteen eighty-eight was a mixed year for British data communications company Racal Electronics PLC.

On the one hand, the company reported worldwide IS revenues down slightly to £311.4 million ($556 million).

On the other hand, Racal celebrated one of the largest and most prestigious deals in its history—a $510 million 10-year contract to provide a government data network in Britain. By 1995, the network will link 240,000 computer terminals in the largest British government departments: Health, Social Security, Inland Revenue (Britain's IRS), Customs and Excise, and the Home Office.

Much of the company's 1988 IS revenues—around 65%—came from the United States, where the company owns network systems supplier Racal-Milgo in Sunrise, Fla., and modem maker Racal-Vadic in Milpitas, Calif. Earlier this year, the company added two new subsidiaries to its U.S. operation when it bought fiber-optic specialist Quanta Communications Systems Inc. in Anaheim, Calif., and local area network firm Interlan Inc. in Boxborough, Mass. The companies are now trading as Racal Quanta and Racal Interlan. Racal's latest venture is with Telecommunications Enterprises Inc., based in Charlotte, N.C., in a joint company called Racal-Milgo SkyNetworks, which offers satellite-based network services.

The company also boosted its European presence in 1988 by adding Paris-based data communications system and equipment supplier Walton SA to its Racal Data Group in Europe. More acquisitions are expected this year as part of Racal's strategy to increase its European business and marketing spread in preparation for the single European market in 1992. The company already has Racal-Milgo subsidiaries in West Germany, the Netherlands and Belgium, and it is building up business in Italy, where it bought local modem company Applicazioni Radio Elettroniche (ARE) in 1987.

With the British government contract under its belt and a broader marketing base, Racal hopes increases in its European business will help pull it back into growth this year.

FINSIEL SPA

Via Isonzo, 21/B
00198 Rome, Italy
(39-6)-851505

78 After opening its first overseas office in San Diego in 1987, Italy's largest software and services company, Finsiel SpA (Finanziaria per i Sistemi Informativi Elettronici), made further forays into foreign lands last year. It began operations in Cyprus, Greece and Spain, providing software and services to local government offices. Further afield, the company also signed a services deal in Moscow last October with the Soviet State Committee for Information Technologies.

This expansion strategy helped Finsiel to boost its revenues to L710 billion ($545 million) in 1988, an increase of 29%. Reflecting the importance of personnel resources in the services sector, the size of the staff rose 21%, reaching 4,912 by the end of the year.

Many of those new employees were hired in Italy, where the firm set up four new subsidiaries. Two of them—Datasiel in Genoa and Sispi in Palermo—are software partnerships with local governments. The third subsidiary—Netsiel, in Bari—is a CASE software center providing network and computer facilities to the whole Finsiel group, which includes 13 other firms operating in banking, finance, services and public agency sectors. Finally, Finsiel formed a joint venture, called Telesoft, with the Italian state telephone company, Sip, to develop telecommunications-related software.

More joint ventures in the local government and networking sectors both inside Italy and other European countries are expected this year.

SONY CORP.
7-35, Kita-Shinagawa 6-chome
Shinagawa-ku, Tokyo 141 Japan
(81-3)-448-2111

79 Last year, Sony Corp. began new efforts to diversify its product portfolio, leveraging its worldwide research network and extensive technology base to cover a much wider range of industrial products. As a part of those efforts, Sony expanded its overseas marketing and production efforts. For instance, Sony Microsystems Inc., a U.S. engineering workstation subsidiary, began manufacturing the Sony NEWS, a 32-bit UNIX workstation. The diversification efforts also include a new concentration on high-growth business areas, such as information-processing equipment, electronic components and telecommunications systems. As a result of these efforts, Sony's international IS revenues, while small, grew faster overseas than they did at home last year.

Still, Sony's major IS market continues to be in Japan. The NEWS series of workstations has proved a success in Japan's fledgling engineering workstation market. The company has made inroads into computer-aided software engineering (CASE) and desktop publishing markets with the system. Moreover, it continues to expand the NEWS series with lower priced models, as well as with versions equipped with optical disk subsystems and desktop-publishing enhancements.

Sales of 3½-inch floppy disk drives and diskettes, which Sony helped pioneer, are doing well, as U.S. PC vendors expand their purchases. Last year, Sony began to produce diskettes and drives in the United States. The company hopes to duplicate its 3½-inch drive success with new 2-inch storage drives. The new drives, which began shipping in mid-1987, are available for portable word processors.

EMHART CORP.
426 Colt Highway
Farmington, CT 06032
(203)-678-3000

80 Emhart Corp. has been on the DATAMATION 100 list for three years because it acquired Planning Research Corp. (PRC), of McLean, Va., and Advanced Technology Inc. (ATI), of Reston, Va., both of which provide computer services to the government. Next year, the Emhart name should be gone.

The terms of the company's recent agreement to be acquired for $2.8 billion by Black & Decker Corp. call for the sale of these two companies, which last year accounted for $654 million of Emhart's $2.7 billion in revenues. Emhart had acquired them as part of a massive three-year restructuring to enhance its growth rate, which in the early 1980s had been languishing at around 2%.

Last year, after shedding 18 businesses and adding two others, Emhart reported a 13% increase in revenue and 19% growth in earnings. It also ended the year with a $2.1 billion backlog. That kind of growth attracted corporate suitors, some not so friendly. Black & Decker was the white knight.

The up-for-sale Information and Electronic Systems (IES) sector saw its revenue increase in 1988 by 25.7% to $508.9 million. But financial analysts noted that rapid growth could be a thing of the past. For example, 78% of PRC's and ATI's business is from the federal government, particularly from now-flattening defense-related projects. Bob Larose, former chief executive officer and founder of ATI, quit the company last October, along with his chief financial officer, and could be a source of competition for government contracts.

WYSE TECHNOLOGY
3471 N. First Street
San Jose, CA 95134
(408)-473-4411

81 After two years of skyrocketing growth, Wyse Technology crash-landed in 1988. Beginning in the summer, demand for Wyse's personal computers simply evaporated. And in the last quarter, sales were down 50%, scoring a $26.4 million loss. For the full year, sales rose 23.3% to just under $500 million, a far cry from the 74% growth rate Wyse saw the year before.

The sorry performance caused some bloodletting in the executive suite. Philip White, an ex-IBMer and computer industry veteran who joined Wyse in 1986 from Altos Computer Systems, resigned as chief operating officer, although he continues as a director.

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Wyse officials attributed the problem almost entirely to the company's decision to raise prices 10% to counter the higher cost of memory chips, a result of the notorious DRAM shortage that altered the fortunes of so many computer companies in 1988. The public, accustomed to Wyse's low-ball prices, stayed away in droves, leaving Wyse's distributors with a load of hardware. Wyse also suffered from the bearish attitude toward high-technology stocks that prevailed on Wall Street for much of 1988. A 1.7 million share stock offering scheduled for August had to be postponed.

After Wyse lowered its prices, revenues began the slow upward climb back to the $100 million-plus level in the first quarter of 1989. In addition to the price cut, Wyse also announced two new high-end 286- and 386-based machines, hoping the higher margins for these more powerful machines can help bolster Wyse's sagging profits. Wyse also introduced two new terminal products; unlike its PC business, sales of Wyse's terminals remained steady throughout the year.

LOTUS DEVELOPMENT CORP.

55 Cambridge Parkway
Cambridge, MA 02142
(617)-577-8500

82 Besieged by development problems with 1-2-3's long-awaited Release 3, Lotus suffered an exodus of development and marketing executives, and its previously stellar financial record was marred. The company experienced its first earnings decline since bursting onto the software world seven years ago with 1-2-3.

The problems caused by Release 3's delay were painfully evidenced by an abrupt sales decline in the latter part of 1988. Although industry sales galloped along at an estimated 40% annual growth rate, Lotus' revenues rose a comparatively weak 18.4%, reaching $468.5 million from $395.6 million a year ago. The increase—half the percentage gain achieved in 1987—was largely thanks to first-half sales performance. In the final quarter, revenues were off modestly and earnings fell a steep 61% compared with figures from the same period of the previous year.

The fourth-quarter profit drop would have been even worse had not the weak U.S. dollar boosted sales outside the United States. International sales in the fourth quarter rose to 38% of total revenues from about 30% in the equivalent period of 1987. For the year, revenues from outside its home market rose to 34% of total sales, or $159.2 million, from $114.7 million the year earlier.

Despite the company's offshore success, many 1-2-3 users held off buying additional packages or looked elsewhere, and earnings for the year fell 18% to $58.9 million from $72 million. Major corporations that had made 1-2-3 a PC standard began adding Redmond, Wash.-based Microsoft Corp.'s rival Excel spreadsheet to their software libraries. The Release 3 delays create a domino effect on products—and sales and profits—whose releases must await the updated spreadsheet. The package is being rewritten in the portable C language to pave the way for promised mainframe, minicomputer and graphical versions.

NCR made 58% of its sales outside the United States; over two-thirds of its manufacturing is done in the United States.

AST RESEARCH INC.

2121 Alton Avenue
Irvine, CA 92714
(714)-863-1333

83 AST Research Inc. made its name in the early 1980s with PC enhancement boards, such as SixPakPlus and Advantage. When Big Blue switched gears in 1987 to the PS/2 personal computer, AST had already decided to make its own machines. It's a good thing it did. In 1988, system products accounted for 70% of AST's $459 million in sales and were the only part of its business that really grew.

The Premium/286, AST's first PC, continued to be the company's best seller, but by the end of the year revenue growth was virtually flat. Some of the slack was picked up by the Premium/386. Two new 386-based PCs, the AST Premium 386/25 and the Premium Workstation 386SX, were expected to begin shipping by this summer.

The switch to higher margin PCs enabled AST to announce, in March of 1988, the company's first year-to-year earnings increase in two years. But that was almost the only good financial news that AST was able to report in 1988. Profit margins were squeezed during the rest of the year, with the company losing $8.6 million in the last six months. AST lowered its prices, cut staff and sold off a subsidiary that makes laser printers and add-on boards for Digital computers. In the first calendar quarter of 1989, sales rose 7.8% and losses were down to only $1.3 million.

ANACOMP INC.

11550 N. Meridian Street
Indianapolis, IN 46240
(317)-844-9666

84 Anacomp Inc., a big player in the computer output microfilm (COM) business, made a successful $400 million tender offer last August for Xidex Corp. of Palo Alto, and joins the DATAMATION 100 for the first time.

Anacomp operates 56 centers in the United States, which convert computer documents to microfilm. The company had acquired the Datagraphix division of General Dynamics Corp. and Consolidated Micrographics Inc., which makes COM duplicators. Datagraphix gave Anacomp a line of COM recorders, processors and duplicators. Xidex, which makes COM readers and reader/printers, also was Anacomp's biggest supplier of diazo and vesicular films.

Xidex started out in the microfilm business and turned to other forms of computer storage in the mid-1980s. Through acquisitions, the company virtually tripled its size, while also capturing 60% of the rigid disk market and 25% of the market for flexible disks. But, two years ago, growth and rapid market changes left the company with a load of obsolete machinery and its first loss in nine years. In 1988, magnetic media sales were flat at $455.4 million. Anacomp plans to spin off the business, retaining, however, some control, but including third-party investors.

Louis P. Ferrero, Anacomp's chairman and chief executive officer, says the $70 million debt the company acquired to help pay $128 million for Datagraphix has been paid off. Anacomp has prepaid $16 million of a $260 million bank loan taken out for the Xidex acquisition by selling off assets, including a thin-film division, sold to HMT Technology Corp., a subsidiary of Hitachi Metals Ltd.

NORSK DATA AS
Olaf Helsetsvei 5
P.O. Box 25, Bogerud 0621
Oslo 6, Norway
(47-2)-62-60-00

85 There isn't much left to shout about at Norway's pride and joy, minicomputer specialist Norsk Data AS. Although 1988 revenues rose slightly to NKr2.93 billion ($450.2 million), the company reported crippling pretax losses of NKr271 million ($42 million). That followed a massive 49% drop in profits the year before.

This sad Nordic saga was the result of two key factors. First, the company was overly dependent on its home market of NorwayThe Norwegian government sector had been a faithful buyer in previous years, but the company lost strategic orders during 1988 to Apple Computer Inc., Digital and IBM. The climax came when the French firm Groupe Bull snatched a prestigious contract with the Norwegian Foreign Office.

Second, Norsk's president, Rolf Skår, had failed to come to grips with technological changes and rising customer demands, which had put pressure on margins. In particular, users in the government sector demanded compliance with standard operating systems. Norsk had always been proud of its high-performance proprietary systems, but no matter how good these were, they simply didn't fit what the customers wanted.

The shell-shocked company has now begun a massive reorganization of its production, marketing and product strategies, which will include some 800 layoffs. A new Dolphin Computers subsidiary has been formed to build reduced instruction set computer (RISC) systems based on Motorola Inc. processors, and Norsk has announced a string of alliances with companies such as Microsoft Corp. and The Santa Cruz Operations Inc. for UNIX-based systems, and with Sybase Inc. for a relational data base system.

AMERICAN EXPRESS CO.
World Financial Center
American Express Tower C
New York, NY 10285
(212)-640-2000

86 Insiders in banking and finance fear and respect American Express Co. as a very savvy user of information technology. Now the credit card king is trying to show the rest of the world how good it really is.

American Express announced this past April that it is consolidating its various information services subsidiaries into a single, separate company and released earnings and revenue statements for this unit. The size of the group surprised even those who follow American Express closely: earnings of $63 million on revenue of $447 million. The biggest chunk of that is First Data Resources Inc., the credit card processor American Express acquired in 1980. But the new unit, called American Express Information Services, is also involved in telemarketing, fund transfers and automation in the health care and cable television industries.

First Data Resources is one of the largest processors of Visa and Mastercard transactions. (American Express does its own credit card transactions through another unit of the company.) First Data Resources also provides information services, such as Medicaid processing, to state and local governments.

Another major component of the new information services unit is the Health Systems Group, which provides services and turnkey systems to more than 1,000 hospitals and medical facilities. It recently acquired McDonnell Douglas Corp.'s health systems unit.

The new focus on information services is American Express' first big strategic move since the surprise departure in March of president Louis V. Gerstner, who left to head RJR Nabisco Inc. Gerstner was widely credited with being a key strategist behind American Express' recent growth.

MAI BASIC FOUR INC.
14101 Myford Road
Tustin, CA 92680
(714)-731-5100

87 When it went public in 1986, MAI Basic Four Inc. launched an aggressive acquisition program in which it netted 30 software, computer maintenance and distribution companies. Two of these included the buy back of MAI Canada Ltd. and a part of Sorbus Inc. The Sorbus buy was partially responsible for the more than doubling—to $147 million—of MAI Basic

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Four's 1988 revenues from computer maintenance.

The synergistic nature of the company's acquisitions strengthened its position as a worldwide supplier of medium-sized computers to small and medium-sized businesses. MAI Basic Four says its installed base now approaches 40,000. But with computer sales growing only 10 to 11% a year, and competition from larger companies—including IBM—intensifying, MAI Basic Four's long-term growth prospects weren't the greatest. So its two largest stockholders went looking for a buyer. When one wasn't found, the company went on offense and, last November, launched an unfriendly takeover of Prime Computer Inc., a company three times bigger than MAI in terms of revenues. Although MAI this spring had amassed 61% of Prime's shares, the matter still is unsettled, and Prime is fighting the takeover bid in court.

In June 1988, MAI introduced a workstation, the MAI 1200 Business Workstation, which can stand alone using PC-compatible software or be linked to hosts through the company's MAI PC-Link. The company also introduced two 32-bit superminicomputer systems—one that increases performance of its older MPx 9400 by two and a half times and a second that operates twice as fast as an older MPx 9600.

Last year, the booming maintenance business helped boost MAI's total revenues to $443 million, 32.6% over 1987's revenues of $334.2 million. Its earnings inched up slightly to $24.3 million from $23.9 million the year before. The lower profit margins resulted from smaller markups of maintenance and applications software and lower hardware gross margins due to competitive pricing pressures.

NYNEX CORP.

335 Madison Avenue
New York, N.Y. 10017
(212)-370-7400

88 In 1988, NYNEX Corp. joined Bell Atlantic Corp. as the second regional Bell holding company to make the DATAMATION 100 since divestiture. NYNEX did it through both homegrown talent and acquisitions, assembling a stable of software and professional services subsidiaries—christened the NYNEX Information Solutions Group (ISG)—that did some $430 million in revenues in 1988 and employs 5,500 employees in 13 countries.

The big player in the ISG fold is AGS Computers Inc., the Mountainside, N.J.-based software and professional services firm acquired last year. AGS has also refocused away from off-the-shelf mainframe software in favor of systems integration and professional services. Ironically, one of its biggest customers is AT&T. AGS is also strong in banking and finance, talents that NYNEX hopes to marry with those of Business Intelligence Services Ltd., the British firm well known for its banking software, acquired by NYNEX in 1987.

The AGS and BIS acquisitions bolster NYNEX's own units, which include NYNEX Computer Services, its professional services firm, NYNEX Development Corp., which manages new ventures in information processing, and the recently formed Complex Systems Integration Group. Already, NYNEX has its hands full as an integrator: it is one of the vendors putting together Empire Net, the $180 million digital voice/data network that New York state is installing to link 98 state agencies, including the 4,000 state lottery sales agents.

The ISG's $430 million in annual revenues is just a blip on the income statement for NYNEX, which had total 1988 revenues of $12.7 billion. A. Theodore Engkvist, president of the ISG, wants to see revenues of $1 billion by 1993. But growth won't come easily. Because the ISG has virtually no presence in the federal government arena, Engkvist is betting that private firms will begin to contract for bigger integration jobs, up from the $1 million to $2 million systems integration contracts that are currently the norm for the commercial sector.

HARRIS CORP.

1025 West NASA Boulevard
Melbourne, FL 32919
(407)-727-9100

89 Harris Corp. sales for calendar 1988 stalled at $2.10 billion, not a big improvement over the $2.08 billion posted in 1987. Net income was $69.6 million, sharply lower than the restated income of $124.7 million for calendar 1987. Net income for 1987 had originally been announced at $92.2 million before the corporation changed its method of accounting for income taxes.

Sales to the U.S. government continue to make up roughly 50% of total company sales. But a smaller and smaller proportion of Harris' federal sales are coming from the Information Systems Sector, a business that continues to battle lower sales and sharply lower profits. Revenues from sales of information technology at Harris fell nearly 5% in 1988. The problem, according to the company, is weak sales of data terminals and systems, as well as reduced computer shipments for government programs. Harris tried to combat the problem in July by merging the Information Systems Sector with the successful Lanier Business Products Sector, best known for its voice communications products.

It remains to be seen what synergy Harris' Semiconductor Sector gains from the company's November $206 million cash acquisition of General Electric Co.'s Solid State operations. The immediate result of the acquisition has been voluntary and involuntary layoffs in Harris' Semiconductor Sector.

Products continued to emerge from Harris in 1988, among them the Night Hawk family of supermicrocomputers, which operate at speeds of up to 48 million instructions per second and are designed for the real-time simulation market. The company inked joint-marketing relationships with some well-known software vendors, including Informix Software Inc. and Oracle Corp.

ORACLE CORP.

20 Davis Drive
Belmont, CA 9400
(415)-598-8000

90 Ancient oracles inhaled gasses emanating from the earth and, entranced, foretold the future. Oracle Corp. must be inhaling appetite enhancers: sales have doubled every year since the company's founding in 1977. In 1988, revenues grew by 114.4% to $424.6 million, and profits were up almost 110% to $62.1 million. Oracle is now the fourth-largest independent software vendor after Computer Associates International Inc., Microsoft Corp. and Lotus Development Corp.

Oracle's success in the market for data base management systems is based on the number of different platforms its software will run on. The company recently claimed its software runs on computers from 55 makers. Oracle's market depth comes from dominating the Digital marketplace. Computer Intelligence Corp., estimates Oracle holds 31% of the relational DBMS market for Digital machines, while Digital's own relational data base system trails at 27% of the market.

But Oracle's success in the midrange market has thus far been unmatched at the top and bottom: IBM's DB2 relational software owns the mainframe marketplace, and Ashton-Tate's dBase outsells Oracle's PC DBMS by more than a quarter million shipments. Oracle is pinning its hopes for growth on applications packages that work with its DBMSs; on increased transaction-processing capabilities; and on its expanding, three-year-old consulting practice.

In November, Oracle went shopping, buying Falcon Systems, a systems integrator in the government market. New product announcements during the year focused on Oracle's Version Six, an RDBMS based on a server architecture, and Oracle TPO, a transaction-processing system that works with Version Six. New applications packages included Oracle Financial and Oracle Mail.

SCIENCE APPLICATIONS
INTERNATIONAL CORP.
10260 Campus Point Drive
San Diego, CA 92121
(619)-546-6000

91 After 20 years as a highly specialized defense contractor, Science Applications International Corp. (SAIC) is going after software and systems integration work. In 1988, it hit the jackpot: a $1 billion, eight-year megacontract to create a medical information system for the more than 700 U.S. military hospitals and clinics around the world. That helped boost the employee-owned company's 1988 IS revenues to $386 million, just under 45% of its total sales and a 24.9% increase over 1987.

SAIC was founded in 1969 by a group of research scientists led by physicist J. Robert Beyster. Sitting on its board today are former defense secretary Melvin Laird and former deputy director of the CIA, Bobby Inman.

Beyster wants SAIC to become a $1 billion company by next year but knows he can't just rely on the national security-type contracts SAIC has gotten in the past.

SAIC is taking on Wang Laboratories Inc. and FileNet Corp. by marketing an optical disk-processing system through IBM. (One of the first customers was the White House.) The company also develops mainframe software—focusing on data storage, system backup and application migration tools—for several leading companies. It is seeking Hollywood producers to participate in marketing a high-definition television system it has created. And it was responsible for the nearly half-million dollars in computer simulation and analysis tools that enabled yachtsman Dennis Conner to regain, albeit briefly, the America's Cup in 1987.

92 Acer Group is spotlighted in the profile on page 144.

SHARED MEDICAL SYSTEMS CORP.
51 Valley Stream Parkway
Malvern, PA 19355
(215)-296-6300

93 A third year of adverse conditions in the hospital marketplace caused Shared Medical Systems Corp.'s overall revenues to decline 3.1% to $378.7 million in 1988. Net income was worse, down 35.1% to $29.4 million.

One industry analyst reports that every vendor, not just SMS, felt the effects of that market's blues. "I think 1988 represented the bottoming out at Shared Medical. Revenues got about as low as they're going to go," says Steve McClellan, first vice president at Merrill Lynch Research & Economics in New York City. Shared Medical's turnkey systems business and its software sales business have been the most depressed, McClellan says, because of a shift at hospitals from buying big-ticket turnkey systems to purchasing shared, remote data services.

Indeed, SMS confirms that sales of Independence, its patient care and financial software for IBM mainframes, were weak last year. However, sales of the company's VAX-based turnkey system, Allegra, won the company new contracts in its first full year on the market. SMS got the system through acquisition and reintroduced it at the beginning of last year.

A few other spots were also bright. Physician Services, which accounts for approximately 10% of SMS' revenues, sold to some large clinics where SMS had not previously been successful. A company spokesman says the success was due to the search by those larger clinics for a single vendor's system that integrates billing, scheduling and other hospital functions.

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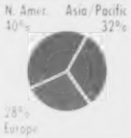
Taiwan's New PC Powerhouse

Acer, the new kid on the DATAMATION 100, began life with $25,000 and 11 employees.

92
Total DP Revenues 379.4

ACER GROUP
602 Ming Sheng East Road
Taipei, Taiwan
(886) 2-713-2252



MINI 11.4
MICRO 295.9
DATACOM 15.2
PERIPH 56.9
REVENUE FIGURES ARE IN MILLIONS OF DOLLARS

Two years ago, Stan Shih, the ambitious president of Taiwan's largest and fastest growing IS firm, Acer Group, surprised many analysts with a forecast that his company would reach $1 billion in revenues by 1991. It seems Shih underestimated his company's potential. Now, K.Y. Lee, the company's vice president of product strategy, says Acer is shooting for $800 million next year and $1 billion by 1990.

That's not bad for a company that began in 1976 as a small family operation with $25,000 and 11 employees. In 12 years, "the Compaq of Asia," as Acer has been called, has become a half-billion dollar company operating through a network of over 1,000 dealers in 41 countries, with subsidiaries in Europe, Japan and the United States.

Last year, revenues rocketed up by 45%, from TD10.5 billion ($366.7 million) to TD15.2 billion ($530.8 million), and profits surged by 62% to TD786 million ($27.4 million).

Stan Shih, Acer's chairman and founder

Around two-thirds of Acer's revenues are from the IS sector. PC products account for 70% of all IS dollars. Additional sales come from peripherals, data communications equipment and UNIX-based multi-user systems. Low-cost IBM PC-compatible machines are still the firm's prime money earners, but Acer is determined to overcome the stigma that cheap, illegal clones have given the Taiwanese PC industry. In 1988, Acer invested $20 million in R&D projects covering UNIX, PCs, peripherals and communications products.

Acer's current microcomputer offerings range from basic PCs to PS/2 model 30 and 50 clones; 25% of revenues come from the firm's 1100 family of 80386-based machines. Acer builds PCs for Unisys Corp., West Germany's Siemens AG, Japan's Canon Inc. and Dutch firm N.V. Philips' GL, among others.

Yet, Acer still has to build brand name recognition outside Southeast Asia. This year, it is investing $20 million in advertising and marketing overseas. In late 1987, it began manufacturing its high-end models in the United States, under an agreement with Texas Instruments Inc. "We want to push our computers in the U.S. and give them the made-in-America image," says Lee.

The United States accounted for 40% of Acer's revenues last year, aided by the acquisition of the San Jose-based UNIX company Counterpoint Computers Inc. The U.S. firm changed its name to Acer Counterpoint Inc. last summer, and a few months ago it was brought under the control of the main U.S. Acer Corp. subsidiary in Atlanta.

Acer's in-house knowledge of the UNIX market is not strong, and it has been looking around for development help. Counterpoint's Japanese distributor, Chiyoda Joho Kiki, which installed the first Acer System 19K UNIX machine in Japan last year, is assisting the development of a communications software interface that will link Acer PC AT-compatibles with Counterpoint's UNIX systems.

Technical problems aren't the only one Shih will have to overcome this year. Production costs are rising, due to IBM's decision last year to collect royalties from the IBM PC clone makers. IBM also slapped a royalty fee, ranging from 1 to 5%, for the Micro-Channel Architecture (MCA) used in the PS/2-compatible line. While Acer will not disclose the details of a patent license arrangement it struck with IBM last year, product vice president Lee says the company is now better able to absorb the additional costs of MCA, due to the recent drop in the price of memory chips.

But Acer isn't placing all its bets on IBM's MCA. The company was among the earliest members of the Extended Industry Standard Architecture (EISA) consortium, which is promoting an open microcomputer architecture. Acer plans to launch its first EISA machine by early 1990. ▭

SEMA GROUP PLC
22 Long Acre
London WC2E 9LY, U.K.
(44-1) 379-4711

94 European services company Sema Group PLC enters the DATAMATION 100 for the first time in the 1988 survey. Sema Group was created by the merger of one of France's leading software and service companies, Sema Metra, and the British-based CAP Group.

Sema is legally incorporated in London, and its chairman, Barney Gibbons, is British. Yet, the company is quoted on both the London and Paris stock exchanges, and the majority of the equity is in French hands, with services giant Cap Gemini Sogeti holding a 22% stake and the French bank, Paribas, holding 39%.

IBM's U.S. business stalled, but Big Blue achieved double-digit growth in Australia, Italy, Japan and Latin America.

Combined company revenues in 1988 totaled £266.9 million ($474.9 million, at £.562 = $1). Excluding the Sofres market research subsidiary in France, its revenues amounted to £210.8 million ($375.1 million).

Around 41% of Sema's revenues came from France, 40% from Britain, 11% from West Germany, the Netherlands and Belgium, and 8% from Spain. The company's customers are primarily in the banking and finance sector (24% of revenues), industry (21%), defense and aerospace (15%), and nonfinancial services (10%). The energy, transportation and government sectors each accounted for 8% of revenues, with telecommunications chipping in 6%.

Apart from financial services, the British side of the firm specializes in software engineering and facilities management through its data networks subsidiary, which in November 1988 won a $63 million, five-year contract to manage the North American and European IS systems for Varity Corp., the holding company for engineering firm Massey-Ferguson.

In France, activities are centered on systems engineering and integration, as well as on control systems for atomic power stations. One of the most prestigious contracts won recently by this side of the house is a $15.5 million deal to computerize the 1992 Barcelona Olympics.

SD-SCICON PLC
Centrum House
101-103 Fleet Road
Fleet, Hampshire GU13 8NZ, U.K.
(44-252) 622161

95 A new entrant to the DATAMATION 100, SD-Scicon PLC is the result of the merger in April 1988 of two major British software

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and services companies—Systems Designers (SD) and Scicon International. SD, the smaller of the two firms, bought out troubled Scicon from its parent, British Petroleum Co. PLC, for £82.5 million ($147 million).

The resulting organization, with 1988 revenues of £221 million ($393 million), now ranks among the top three European services companies, with over 5,000 employees in 50 offices around the world.

Broken down by area of activity, the DP revenues of £205 million ($364 million) include professional consulting fees of £139 million ($247 million), hardware sales of £21 million ($37 million), and maintenance and other services of £45 million ($80 million).

The company's sector operations span communications, finance, energy, defense and aerospace, and government. Last year, three-quarters of SD-Scicon's revenues came from Europe, with over half of that coming from France and Germany. The United States contributed £51.5 million ($92 million).

In August 1988, the company's British operations were divided into two sectors of about 1,250 employees each. The SD offices now handle the government, defense and aerospace business, while Scicon deals with the commercial side—industrial, financial and energy.

Scicon Energy, which concentrates on large, complex computer systems, is the fastest growing part of Scicon in Britain. However, across the Atlantic, things are different. Last fall, SD-Scicon decided to sell off its Palo Alto-based energy systems group to Combustion Engineering of Stamford, Conn., for $12 million.

DATAPRODUCTS CORP.
6200 Canoga Avenue
Woodland Hills, CA 91365
(818)-887-8000

96 Shipments of Dataproducts Corp.'s line and laser printers heated up in mid-1989, and the company began to recover from its 1987 losses, despite an unusually big March 1988 quarter drop of $14.9 million. Although the company finished calendar 1988 with an $11.3 million loss, its last three quarters were profitable. Calendar 1988 revenues increased 9.1% to $364.5 million from $334.2 million.

The heavy loss in the March quarter—the last quarter in Dataproducts' fiscal year—was due chiefly to the $10 million the company incurred to move its serial printer business from New Hampshire to California to take advantage of more efficient manufacturing techniques. Another $6 million was a one-time charge against earnings from its decision to invest foreign earnings in the United States. The move is now paying off in higher interest earnings.

Together with the acquisition of Imaging Solutions Inc. of Brookfield, Conn. (the owner of a new technology called solid ink jet printing), these steps drew the attention of investors. DPC Acquisition Partners of New York City has been making acquisition overtures since last December, and DPC—ironically, the letters also make up Dataproducts' stock market trading symbol—now owns 7.7% of Dataproducts stock. Early this spring, the DPC investment group was threatening to initiate a tender offer for all of the company. Dataproducts has hired Goldman, Sachs & Co. to search for other buyers.

Hewlett-Packard's biggest single customer, the U.S. government, accounted for 5.9% of 1988 sales, down from 1987's 8.3%.

While the company claims that no final decision has been made to sell, Dataproducts has sent proprietary information about itself to U.S. subsidiaries of Hitachi Ltd. and Toshiba Corp. Japanese buyers were considered by analysts to be the most likely takers because the company would provide them with a direct channel to a larger U.S. corporate base.

DIEBOLD INC.
818 Mulberry Road S.E.
Canton, OH 44711
(216)-489-4000

97 Although Diebold Inc.'s revenues have been climbing slowly, competitive pressures have left earnings pretty flat for the last three years. DATAMATION estimates Diebold's 1988 sales of automatic teller machines (ATMs) at $362.8 million, up 5% over 1987's figures. Total corporate revenues hit $450.6 million, up 2.6% from 1987's $439 million. Profits are stuck at about $36 million, give or take a few hundred thousand. So the company is looking to turn more of its sales into profits. Early this year it laid off some 60 employees, reorganized the banking products marketing organization and planned to introduce new automation in its manufacturing systems.

Diebold plans to expand its international sales, which accounted for less than 10% of revenues in 1988. Diebold intends to keep R&D spending at about 4% of revenues—$18.4 million this year—a level it has maintained for the last three years. Analysts seemed to approve of the company's moves, especially its R&D spending levels, as new markets are expected to open in the automatic teller machine replacement field.

In a recent report, D.A. Zwyer of Kidder, Peabody & Co. Inc. said Diebold stands to be a major beneficiary of the coming resurgence in ATM orders with a projected 46% share of the ATM market. The bulk will be in the replacement market, where most banks have fully depreciated existing ATMs and are expected to be ordering new ones at the rate of some 19,000 units a year in the United States. The report says banks want new models to stimulate new business. Bank market studies show that only 15% of customers use ATMs on a regular basis.

ATARI CORP.
1196 Borregas Avenue
Sunnyvale, CA 94088
(408)-745-2000

98 If there are no second acts in great American success stories, then how does anyone explain the encore of Atari Corp.? Led by Jack Tramiel, who bought Atari in 1984 from Warner Communications Inc., the one-time video game king has emerged as a potent force in the low-cost PC arena. Last year, Atari sold $361.8 million in PCs, doubling its sales from 1986 and dwarfing the video game side of its business by a margin of four to one.

Atari's niche is the $2,000-and-under machine. In 1988, it introduced a laptop version of its 68030-based ST, the company's bread-and-butter machine. And in April of 1989, it brought out the Portfolio, a 4 × 8-inch, notebook-sized unit with an eight-line display. Atari has high hopes for the $800 Portfolio, with company officials likening its potential to that of the Commodore 64 in the mid-1980s.

But it won't come easily for Atari. In 1988, the company recorded an $84.8 million loss after writing off its disastrous foray into retail electronics. Since sales of VCRs peaked in 1986, consumer electronics stores in the United States have gone into a tailspin. Tramiel engineered the purchase of the Federated Group Inc. chain in 1987, hoping to turn around a money-losing operation and give Atari much-needed retailing exposure. Now analysts are wondering how Tramiel, who has a stellar record in such things, ever got involved with such a dog. Shaky, too, is Atari's video game business, in which Atari is contending with Nintendo, the phenomenally successful Japanese company that revived the business Atari once called its own.

As if all that weren't enough. Atari estimates it lost nearly $100 million in sales because of a shortage of memory chips in 1988.

MICROPOLIS CORP.
21211 Nordhoff Street
Chatsworth, CA 91311
(818)-709-3300

99 Micropolis Corp., which reported a profit of $27.3 million in 1987, last year lost $19.4 million. For the designer and manufacturer of disk drives, the bad news was the ironic result of a hot-selling product.

In 1988, Micropolis' most unprofitable product—the 1550 series 380 megabyte 5¼-inch disk drive—nearly doubled in popularity, accounting for around 40% of sales. While Micropolis has been working feverishly to cut the cost of manufacturing the 1550, at one time during 1988 it was losing from $200 to $300 on every one it shipped at a price of $1,300. For example, in the third quarter, its sales of that disk drive soared to $40 million from $22.5 million in the second quarter. In addition, sales of a very profitable 170MB drive began to fade—from $50 million in the second quarter to $38 million in the third.

Nevertheless, Micropolis' good (or is it bad?) luck with the 380MB device was a big contributor to a 1988 sales increase to $353 million, from $288.32 million the year before. And analysts think the current downward cycle in disk drive business has reached bottom. "The road back to acceptable levels of profitability will be difficult and lengthy for most companies," says analyst John C. Furlan of San Francisco-based Montgomery Securities.

To cut costs, Micropolis has shifted from thin-film heads to less expensive composite heads. It reduced employment 40% last year by shifting 90% of its labor content to Singapore and also by transferring subassemblies from Singapore to Thailand.

The company got breathing room early this year by negotiating a $20 million short-term bank line of credit. And it has some new products this year: a half-height 180MB and a half-height 380MB drive, a full-height 760MB drive and a 3½-inch 200MB drive. Analysts think these products could contribute about $60 million to revenues, but add that Micropolis will probably have to wait until year end to become profitable.

EASTMAN KODAK CO.
343 State Street
Rochester, NY 14650
(716)-724-4000

100 Eastman Kodak Co. jumped on the UNIX and open systems bandwagon in 1988, acquiring Interactive Systems Corp., a 12-year-old UNIX software and services company.

Founded in 1977, Interactive offered the first commercially supported version of UNIX and was the firm that developed a version of UNIX for IBM's AT. With annual sales of $55 million, the company stands as the cornerstone in Kodak's newly formed Software Systems Division. It should also bring some standardization to Kodak's various IS activities. These activities include optical disk systems, the ATEX publishing system and Kodak Information Management Systems, all of which are currently based on proprietary architectures.

Interactive Systems is one of a string of recent acquisitions by Kodak in the information business. Others include Yourdon Inc., a consulting, training and software development firm; Aquidneck Corp., specializing in software development for the federal government; and, in February 1989, Lachman Associates Inc., another UNIX software company, now folded into Interactive Systems.

IS-related products and services accounted for some $350 million in revenues at Kodak in 1988, only about 2% of the company's overall $17 billion in sales. More than half of Kodak's IS revenues are generated by Verbatim Inc., which makes computer disks. The big news at Verbatim in 1988 was its successful petition to the U.S. International Trade Commission, a petition in which it charged Japanese firms with dumping floppy disks on the U.S. market.

The company profiles in this issue were written by 20 DATAMATION bureau managers, editors and correspondents. Profiles of the U.S.-based companies are by Eric Brand, Ralph Emmett Carlyle, Marsha J. Fisher, Robert Francis, Parker Hodges, Joseph Kelly, Susan Kerr, Tom McCusker, Gary McWilliams, Jeff Moad, Willie Schatz and David Stamps. Profiles of the European-based companies were written by Tina Esh, James Etheridge, Janette Martin, Boris Sedacca and Peggy Trautman. Profiles of Asian-based companies were written by Stuart Dambrot, Oles Gadacz and Claudia Nalven. The profiles were edited and the data gathered by Marsha J. Fisher, Parker Hodges, Joesph Kelly, Gary McWilliams, Lauren Murphy and Paul Tate.

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Inside The Markets

Analyses of eight key IS market sectors: mainframes, minis, micros, software, services, peripherals, data com and maintenance.

The DATAMATION 100 surveys the financial results of technology vendors: MIS's hard currency response to the offerings of information systems vendors worldwide. The next section delivers a different view. In these pages, trend spotters from eight top information research houses analyze the forces shaping eight basic IS market segments: mainframes, minicomputers, microcomputers, peripherals, software, data communications, information services and maintenance.

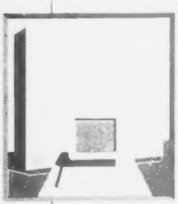
Realism, not blue-sky musing, marks the views of these technology watchers. They tell what's up, what's down, who's got it and who's missed the boat in each of the markets—markets in which IS executives make crucial choices.

Here, then, is a quick guide to the technologies essential for running today's businesses and to the vendors that sell these technologies. The mainframe sector is discussed by Steven Milunovich of First Boston Corp.; minicomputers by Stephen K. Smith of Paine Webber Inc.; microcomputers by Virginia Ewell of The Yankee Group; maintenance by Doug McLeod of the International Data Corp.; peripherals by Greg Blatnik, Jim Upham and Phil Devin of Dataquest Inc.; software by Michael Braude of Gartner Group; information services by Robert L. Goodwin of Input; and data communications by Kim Myhre of Cahners Business Research Group. Each of the Technology Insights includes a table showing the 15 leading vendors in the market sector being discussed. The tables also show each vendor's position in the world ranking of the DATAMATION 100, and give each vendor's revenues in the market sector.

IBM SOLID, AMDAHL SOARS, NAS LIMPS AND UNISYS FACES TRANSITION

BY STEVEN MILUNOVICH

As IBM mainframe chief Carl Conti said recently, "Read my MIPS—the mainframe is not a dinosaur." Results in 1988 backed him up: mainframe sales were solid worldwide and particularly strong in Europe and Japan. IBM maintained its lock on the big box market with the 3090 series, but Amdahl Corp. managed to gain share for the third consecutive year.



The mainframe's roles as a data base and network manager became more evident. And IBM's introduction of Enterprise Systems Architecture (ESA) assured the mainframe's place in enterprise management in coming years.

Although IBM long ago won the mainframe war, skirmishes continue. Given that IBM's 3090 was announced in 1985, a second consecutive year of double-digit revenue gains for the 3090 was an impressive feat in 1988. Still, IBM's mainframe sales growth may decelerate during 1989-1990, as the next generation Summit will not even be announced until third-quarter 1990. Furthermore, the IBM/Fujitsu arbitration ended with Fujitsu Ltd. paying IBM for the right to have a reasonable opportunity to independently develop and maintain IBM compatibility.

The plug-compatible vendors experienced a mixed year in 1988. Amdahl scored by preempting IBM's 3090S with its 5990 in May. Amdahl's 5990 was the first to break the 100MIPS barrier, beating the July-announced IBM 3090S by two months. The 5990 took the giant by surprise, perhaps even forcing IBM's 3090S hand, which may have led to the logic chip production problems IBM has encountered. National Advanced Systems Inc., however, fell behind in the performance race, unable to come up with partitioning capabilities similar to those provided by Amdahl's Multiple Domain Feature and IBM's PR/SM products.

Other high-end players also had a rough time. Unisys Corp. entered a period of product transition on the Sperry side of the house, in the process depressing shipments. But the new 2200, replacing the successful 1100 line, is now in delivery. Control Data Corp.'s Cyber business continued to suffer as new competitors in the scientific arena nipped at the company's heels and chip delays held back deliveries of new systems. Cray Research Inc.'s growth was slowed by the transition to the Y-MP and surprising demand for smaller, less profitable supercomputers. Siemens AG's mainframe sales were about flat, as U.S. companies gained a bigger piece of the European pie. Bull HN came battling back, however, with its new NEC Corp.-sourced DPS 9000, offering the world's fastest uniprocessor at a breathtaking 40MIPS.

IBM considers its MVS/ESA operating system to be a major technological breakthrough, and Big Blue expects it to take its place as the architectural platform of the 1990s. ESA expands addressability to 16 gigabytes and provides automatic storage management through the Data Facility Storage Management Subsystem (DFSMS). MVS/ESA and DFSMS running on the 3090S models offer 52% more Customer Information and Control System (CICS) transactions, a 120% improvement in DB2 queries and 20% better disk utilization.

Unisys also responded with its Extended Transaction Processing Architecture (XTPA) for the 1100/2200. Unisys benchmarks yielded a rate of 5,000 transactions per second by closely coupling up to four processors to one data base. Cray spent 45% of its research and development funds last year on software, coming up with Autotasking, an automatic parallel-processing capability that can provide up to eightfold increases in computation speed. Finally, vendors are testing the UNIX waters with supercomputer offerings from Cray and Control Data's ETA Systems subsidiary, as well as mainframe UNIX versions from Amdahl and IBM.

The competition could get even tougher at the high end for two reasons. First, companies like Digital Equipment Corp. are being forced to enter the mainframe market to find revenue to support their cost structures. This could invoke another shakeout similar to when General Electric Co., RCA Corp. and Xerox Corp. exited the business in the 1970s. Second, microprocessor-based systems may eventually pressure the mainframe from below just as stand-alone minicomputers are being shunted aside today. The mainframe companies' success in solution selling and enterprise management through approaches like IBM's Systems Application Architecture will determine big iron's contribution in 1989 and years to come.

Steven Milunovich is a director of First Boston Corp.

The Top 15 in Mainframes

The Japanese proved in 1988 that there's still plenty of life in the mainframe business—and so did Amdahl and Comparex.

	DTM 100 RANK	COMPANY	MAINFRAME REVENUES 1988 ($MIL.)	MAINFRAME REVENUES 1987 ($MIL.)	% CHANGE*	MARKET SHARE†
1	1	**IBM**	12,138.8	11,193.0	8.45	40.1
2	3	**Fujitsu**	4,184.9	3,318.2	26.12	13.8
3	4	**NEC**	4,033.1	3,082.0	30.86	13.3
4	6	**Hitachi**	2,507.3	1,850.4	35.50	8.3
5	28	**Amdahl**	1,225.2	926.2	32.28	4.0
6	5	**Unisys**	1,175.0	1,322.0**	(11.12)	3.9
7	11	**Groupe Bull**	901.0	844.0**	6.75	3.0
8	8	**Siemens**	683.4	695.5	(1.74)	2.3
9	22	**STC**	658.4	596.8	10.32	2.2
10	64	**Cray Research**	632.9	588.3	7.58	2.1
11	16	**Control Data**	465.0	510.0	(8.82)	1.5
12	25	**Nihon Unisys**	384.8	226.9	69.59	1.3
13	51	**National Semiconductor**	372.0	362.0	2.76	1.2
14	73	**Comparex**	239.7	133.0	80.23	0.8
15	10	**NCR**	218.3	200.3	8.99	0.7

*In local currency, Fujitsu's mainframe revenues were up 11.8% to ¥536.3 billion, NEC's were up 16% to ¥516.8 billion, Hitachi's were up 20.1% to ¥321.3 billion, Groupe Bull's were up 5.8% to Fr5.4 billion, Siemens' were down 4% to DM1.2 billion, STC's were up 1.4% to £370, Nihon Unisys' were up 50.3% to ¥49.3 billion and Comparex's were up 76.2% to DM421.0

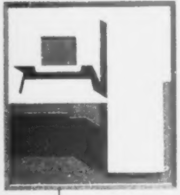
**Restated figures for 1987

†Percentage share of DTM 100 mainframe revenues

☐ THE AS/400 AND OLTP HEAT UP COMPETITION IN A REVIVING MARKET

BY STEPHEN K. SMITH

Ads for minicomputers on TV? Tiny MAI Basic Four Inc. buying Prime Computer Inc.? IBM's John Akers, Digital's Kenneth Olsen and Hewlett-Packard Co.'s John Young on the same stage (at the Open Systems Foundation launch) and apparently on the same side? IBM with a hot minicomputer product? Apple Computer Inc. and Digital teaming up? HP and 3Com Corp.? If 1988 was anything to go by, 1989 looks like an interesting year for the minicomputer vendors.



While major weekly business publications were again writing the minicomputer's obituary, IBM's AS/400 exceeded just about every industry watcher's forecast. IBM did enough with AS/400 to maintain its loyal S/3X base, although questions remain about whether or not small-business users really want or need the prowess of Systems Application Architecture (SAA) or Systems Network Architecture (SNA). However, because of the enormous demand from within its base (IBM shipped 25,000 units in the latter part of 1988), IBM has not priced the AS/400 overly aggressively. Nevertheless, the machine poses a long-term challenge to Digital and HP.

Even before IBM introduced the AS/400, Digital's growth rate had hit the skids. The problem was all at the high end, with the aging and expensive 8800 line. Since a six-processor 6360 (announced in January 1989) offers performance equivalent to the current top-of-the-line 8840 at about half the price, the 6200 and more recent 6300 have all but killed off the 8800 for Digital.

To help solve this problem, by early 1989, the entire VAX family (with the exception of the forthcoming Aridus mainframe) had been transferred to microprocessor technology. In another big move, Digital claims it has improved the performance of its VAX computers in addressing OLTP applications by a factor of 10. Most significant was the dramatic fivefold improvement in the performance of its relational data base product, Rdb, now bundled in with the VMS operating system. Even so, don't expect Digital to make major headway in OLTP for another year or so, when it introduces the long-awaited Aridus.

While there is room for both Tandem Computers inc. and Digital in the non-IBM OLTP market, Digital is still two to three years behind Tandem. Tandem has a broad range of applications, a strong OLTP base and credibility in a market in which credibility is vital. Recent product introductions include NonStop structured query language (SQL), which provides compatibility with IBM's Database 2 (DB2), but with major (up to threefold) price/performance advantages and superior functionality (fault-tolerant, distributed capabilities).

Hewlett-Packard finally turned the corner with its Spectrum product line in 1988. The August release of MPE 1.1 minicomputer operating system was a key factor. Performance and reliability concerns now appear to be behind the company. Hewlett-Packard saw a large increase in orders for its commercial Spectrum machines from the third to the fourth quarter, but it will likely be a while before Spectrum makes a more noticeable impact on this $10 billion company.

Data General Corp. president Edson de Castro's goal is to turn that company into the leader in open systems. Data General is introducing a whole line of products based on Motorola Inc.'s 88000 RISC chip, although those products are unlikely to have significant revenue impact until fiscal year 1990. DG—like the remaining second-tier players—must attract software to its new open platform if it is to compete on the basis of function as well as on price.

For the first time in years, Wang Laboratories Inc. has introduced competitive products in a timely fashion at the low end (VS5000) and high end (VS10000). A complete product overhaul is expected by year's end, including a new midrange model (Merlin). These new products appear to be getting a much better reception from Wang's customers than some of the company's earlier introductions did, like the ill-fated VS 300. The key to Wang's future is whether it can use imaging and PC-based applications, such as Freestyle, to leverage VS hardware sales.

The battle over UNIX will determine who controls the development of a commercial version of the operating system. From a user standpoint, the issue is as clear as mud. Will the Open Systems Foundation and UNIX International make friends in 1989? Odds are slim: users are going to have to wait a lot longer before key UNIX issues are resolved. ▭

Stephen K. Smith follows computers for Paine Webber Inc.

The Top 15 in Minis

Workstations propelled Sun to the top ranks, while Digital cooled down and Wang went flat again.

	DTM 100 RANK	COMPANY	MINICOMPUTER REVENUES 1988 ($MIL.)	1987 ($MIL.)	% CHANGE*	MARKET SHARE†
1	1	IBM	4,400.0	4,000.0 **	10.00	18.2
2	2	Digital Equipment	3,735.6	3,248.4	15.00	15.5
3	7	Hewlett-Packard	1,500.0	1,221.0	22.85	6.2
4	37	Sun Microsystems	1,096.2	566.9 **	93.37	4.5
5	13	Toshiba	1,092.1	919.6	18.76	4.5
6	5	Unisys	1,080.0	1,125.0 **	(4.00)	4.5
7	3	Fujitsu	991.2	804.3	23.24	4.1
8	17	Wang	912.1	909.3	0.31	3.8
9	25	Nihon Unisys	658.5	400.1	64.58	2.7
10	34	Prime	626.7	387.0	61.94	2.6
11	9	Olivetti	614.3	603.9	1.72	2.5
12	38	Tandem Computers	557.0	472.8	17.81	2.3
13	44	Mitsubishi	490.5	403.3	21.62	2.0
14	18	Nixdorf Computer	484.1	466.6	3.75	2.0
15	11	Groupe Bull	477.0	446.8 **	6.76	2.0

*In local currency, Toshiba's mini revenues were up 5.2% to ¥139.9 billion, Fujitsu's were up 9.2% to ¥127 billion, Nihon Unisys' were up 45.8% to ¥84.4 billion, Olivetti's were up 2.1% to L799.6 billion, Mitsubishi's were up 7.8% to ¥62.9 billion, Nixdorf's were up 1.4% to DM850 Groupe Bull's were up 5.8% to Fr2.8 billion

**Restated figures for 1987

†Percentage share of minicomputer revenues

TECHNOLOGY INSIGHTS

MICROCOMPUTERS

☐ A COLLISION BETWEEN POWERFUL PCs AND LOW-COST WORKSTATIONS

BY VIRGINIA EWELL
and YANKEE GROUP STAFF

By the end of 1989, we will have had our first real view of the race between the traditional workstation and PC vendors. While the cost of workstation products and platforms from companies such as Apollo Computer Inc., Hewlett-Packard Co., Mips Computer Systems Inc. and Sun Microsystems Inc. has been dropping, the performance power of the PCs from Apple Computer Inc., COMPAQ Computer Corp., Dell Computer Corp. and IBM has been increasing. Two markets are now vying for the middle ground.

The traditional PC platforms from Intel Corp. and Motorola Inc. have brought a significant power increase with their new chips, the 80486 and the 68030, respectively. The 80486 is designed to yield two to three times the performance of the 80386, with full binary compatibility with the 80X86 MS-DOS environment. The 68030 is targeted to yield 7 million instructions per second (MIPS) and improve throughput, thanks to an on-chip Memory Management Unit, data cache and address cache, as well as a dual-address bus and data bus.

In the RISC-based workstation arena, there are the SPARC-based processors from Fujitsu Ltd. and Sun, the Intel 80860, the Mips R3000 and the Motorola 88000. As a result of these chip advances, the workstation market delivers the same power and product at reduced cost, and the PC market delivers a more powerful product at the same cost as existing PCs. Sooner or later, these markets are going to have to meet.

What will this collision mean? First, customers will buy what they are most comfortable using. Those who are comfortable and happy with MS-DOS will not likely hop on the UNIX bandwagon. Second, PCs and workstations have different strengths and weaknesses. But, as they compete with one another, each will improve by absorbing the better techniques and features of its rival.

Who is the customer for high-end PCs? These users will be professionals, using their machines primarily for highly interactive, ad hoc access to enterprise-level information and graphics-intensive applications.

The application technologies that will drive this advanced user include those involving compound document architectures, next-generation network computing and computer-mediated work group technology. These three application technologies allow team members to function as a cohesive unit.

Hewlett-Packard is clearly positioning itself to benefit from this new trend. When it fulfills its announced plan to acquire workstation vendor Apollo, HP can field a solid workstation line based on several underlying processors. Combined, the workstation market share of Apollo and HP surpasses both that of Digital and Sun. Meanwhile, Sun also is undergoing a remarkable shift. Just as Apple charges headlong into the corporate computing world with a battle cry of "The computer for the rest of us," Sun has now adapted the phrase, "The UNIX for the rest of us."

But don't count Digital out of this new desktop market. By the end of 1991, The Yankee Group believes workstations will be Digital's second-largest revenue producer. Nevertheless, the Maynard, Mass., giant is temporarily on the defensive, and it must scramble if it is to overcome its increased vulnerability to rivals Sun and HP.

Although the movement was originally inspired by Apple's flagship product, the Macintosh, Apple will struggle to maintain momentum in this new era of desktop computing. But Apple knows the location of the target and is willing to speculate that the PC/workstation will be operating at 100MIPS within five years.

IBM has split its desktop initiative between its Advanced Workstation Division and its Entry Systems Division. While IBM's two-pronged approach may very well succeed in the long run, it is a dangerous one in the short term: the company's dual focus could result in an ever-widening divergence, when the desktop market itself is converging.

The future of the traditional PC world will be consumed with debates concerning UNIX versus OS/2 versus DOS and MicroChannel versus Extended Industry Standard Architecture (EISA). The indicator in the operating systems war will be the positions taken by major software developers. Watch who is porting to UNIX versus OS/2. Then watch what happens with sales. Right now, DOS is winning. Even those who port to UNIX will maintain DOS as a cash cow. ▭

Virginia Ewell is director of distributed systems research at The Yankee Group in Boston.

The Top 15 in Micros

Apple, Compaq and Zenith continued to soar in 1988, but Tandy and Amstrad couldn't keep up.

	DTM 100 RANK	COMPANY	MICROCOMPUTER REVENUES 1988 ($MIL.)	1987 ($MIL.)	% CHANGE*	MARKET SHARE†
1	1	IBM	7,150.0	6,500.0 **	10.00	25.5
2	12	Apple	2,950.0	2,069.0	42.58	10.5
3	24	Compaq	2,065.6	1,224.0	68.76	7.4
4	9	Olivetti	1,427.5	1,176.0	21.39	5.1
5	29	Tandy	1,232.2	1,132.2	8.83	4.4
6	39	Zenith	1,220.4	936.0 **	30.38	4.4
7	4	NEC	1,204.7	933.2	29.09	4.3
8	13	Toshiba	1,083.4	800.0	35.43	3.9
9	5	Unisys	1,050.0	732.0 **	43.44	3.7
10	59	Amstrad	784.0	685.3 **	14.40	2.8
11	7	Hewlett-Packard	670.0	499.0	34.27	2.4
12	21	AT&T	630.0	540.0	16.67	2.2
13	54	Commodore	601.1	514.3	16.88	2.1
14	3	Fujitsu	595.3	463.3	28.49	2.1
15	14	Matsushita	585.0	436.8	33.93	2.1

*In local currency, Olivetti's micro revenues were up 21.8% to L1.9 trillion, NEC's were up 14.4% to ¥154.4 billion, Toshiba's were up 20% to ¥138.8 billion, Amstrad's were up 5.1% to £440.6 million, Fujitsu's were up 13.8% to ¥76.3 billion, Matsushita's were up 18.7% to ¥75 billion

**Restated figures for 1987

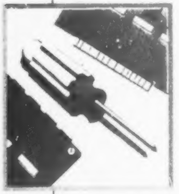
†Percentage share of DTM 100 microcomputer revenues

TECHNOLOGY INSIGHTS
MAINTENANCE

☐ DOWNSIZING, RELIABILITY AND INNOVATION CHANGE THE GAME

BY DOUG McLEOD

Competitors in the increasingly fierce $12 billion U.S. computer hardware maintenance and $1 billion data communication maintenance markets are playing a new game. Downsizing, increasing reliability and innovative maintenance technologies are changing the rules. Service providers are seeing traditional hardware services revenue shift toward a host of "soft" services, offered by an aggressive, market-driven IBM and more savvy third-party maintainers. These factors are resulting in a transfer of negotiating leverage away from vendors and toward buyers of computer services. IBM's growing willingness to listen and respond to customers' service needs is forcing other service vendors to offer competitive, aggressively priced programs. Growing by 4%, and by over 100% in workstation and PC arenas, the hardware maintenance market is one in which the only constant is change.



With a greater number of applications migrating to local area network (LAN) and PC-based platforms, service revenue growth for all but low-end systems has become almost flat. Mainframe service growth will continue to creep up. While downsizing will stimulate midrange equipment sales, intense competition in the midrange service markets will result in smaller maintenance revenue and growth. Increasing reliance by vendors and users alike on dealers, which sell a greater proportion of PC and LAN solutions, is forcing manufacturers to develop shared responsibility dealer service strategies, a daunting task that presupposes loss of account control.

In addition, the increasing reliability of hardware components and major vendors' renewed aggressiveness have spawned the emergence of commodity markets for repair services in major cities. As a result, providers are diversifying into related services, such as software support, disaster recovery and network support. Because the company servicing the network controls the network, it's no surprise that within the past 12 months no fewer than a dozen major hardware manufacturers have announced their intention to become "major" network services suppliers. As remedial hardware maintenance revenues fall, service profit centers will continue to diversify into related areas.

To survive, providers must offer and deliver well-defined services for a specified range of products. This need to focus is engendering previously unheard of partnerships. For example, LAN rivals Novell Inc. and 3Com Corp. both now count Hewlett-Packard Co. as a major service partner. Third-party maintainers also have been forced to execute careful cost-benefit analyses by product line to assure the ongoing profitability of their service programs and products. They are focusing on vertical market niches: Sorbus Inc.'s four acquisitions are all depot repair firms offering high levels of very specific expertise with low overhead.

Responding to long-standing criticism, in January, IBM announced a new service-ordering firm to simplify the complex process of signing up for IBM programs. Under the ServicePlan umbrella, users can order services such as network support, customized relocation services and an estimated-billing option that simplifies service tracking and management in larger accounts. HP is rolling out a new class of service—multivendor support—which aims to minimize vendor finger-pointing by providing a single service vendor contract. Digital has hinted at a similar forthcoming announcement.

In the face of declining revenues in traditional service areas, vendors are introducing products with telecommunications services and built-in predictive maintenance capabilities designed to increase customers' self-sufficiency without losing customer satisfaction. Third parties are providing standalone AI diagnosis and repair systems geared toward end users and field engineers.

The net result of widespread multisourcing of hardware maintenance is a shift in control of the negotiation process from service vendors to users. Users are demanding guaranteed uptime with penalty clauses and unheard of flexibility in their negotiations with service vendors. Others are requiring vendors to participate in innovative billing solutions that provide precise levels of support for different installations and equipment, depending on criticality. Vendors are finding that simply supplying well-trained technicians on a timely, professional basis is no guarantee of a successful, or profitable, service business. ▭

Doug McLeod is senior analyst of network and communications support for International Data Corp.

The Top 15 in Maintenance

Competition and price cutting kept maintenance revenues down in 1988.

	DTM 100 RANK	COMPANY	MAINTENANCE REVENUES 1988 ($MIL.)	1987 ($MIL.)	% CHANGE*	MARKET SHARE†
1	1	**IBM**	7,347.0	7,691.0	(4.47)	25.7
2	2	**Digital Equipment**	3,882.3	3,086.8	25.77	13.6
3	5	**Unisys**	1,971.0	1,952.0	0.97	6.9
4	10	**NCR**	1,678.6	1,556.0	7.88	5.9
5	11	**Groupe Bull**	1,374.7	1,290.8	6.50	4.8
6	3	**Fujitsu**	1,006.3	799.9	25.80	3.5
7	7	**Hewlett-Packard**	980.0	800.0	22.50	3.4
8	8	**Siemens**	968.1	1,001.5	(3.33)	3.4
9	9	**Olivetti**	929.6	820.4	13.31	3.3
10	17	**Wang**	829.4	822.3	0.86	2.9
11	6	**Hitachi**	742.3	639.6	16.06	2.6
12	34	**Prime**	560.0	318.7	75.71	2.0
13	42	**Data General**	450.2	435.0	3.49	1.6
14	19	**NV Philips**	417.3	385.1	8.36	1.5
15	23	**Memorex Telex**	417.1	198.0	110.9	1.4

*In local currency, Groupe Bull's maintenance revenues were up 5.6% to Fr8.2 billion, Fujitsu's were up 11.5% to ¥128.9 billion, Siemens' were down 5.6% to DM1.7 billion, Olivetti's were up 13.7% to L1.2 trillion, Hitachi's were up 2.8% to ¥95.1 billion, Philips' were up 5.8% to G825 million and Memorex Telex's were up 105.6% to G824.6

†Percentage share of DTM 100 maintenance revenues.

☐ TWEAKS IN A MATURE TERMINAL MARKET, TROUBLE IN DISK DRIVES

BY GREG BLATNIK, JIM UPHAM AND PHIL DEVIN

The display terminal industry experienced a turbulent 1988. Although U.S. shipments grew about 3% over 1987 to 2.87 million units, not all participants enjoyed the market growth. Many factors contributed to uneven performance. The industry's leaders, AT&T, Digital Equipment Corp., Hewlett-Packard Co., IBM, Memorex Telex Corp. and Wyse Technology employed a variety of strategies to increase their market presence.

The leading vendors have used their economies of scale to achieve lower costs and better margins than their competitors. Each has invested heavily in company-controlled automated manufacturing facilities in the U.S. or in Asia.

However, many vendors faced mounting challenges in 1988, primarily caused by offshore manufacturing choices. The cost advantages of low-volume Asian manufacturers of display terminals is evaporating. Vendors are scurrying to line up new manufacturers, and some are moving manufacturing back to the U.S.

The display terminal is a mature product, and very few technological breakthroughs are expected. Dataquest Inc. expects a trend toward better display quality: higher refresh rates, overscan and higher resolution. We are seeing more and more vendors introduce terminals with local-processing capability, usually with built-in network interfaces for use in place of PCs on local area networks.

Other technological trends include increased use of standard and custom very large scale integration (VLSI) chips to reduce chip count, improve reliability and add unique features. Many products are expected to incorporate bit-mapped displays, as windowing and graphical user interfaces become common in applications. Dataquest expects an increasing use of terminals on LANs, further improvement of display quality and input methods and a growing market for terminals that support the X Windows System.

One of the most dynamic areas in the electronic printer industry is the low-end page printer market. In the U.S., this market has seen a growth in unit sales from its effective introduction in May 1984 to almost 1 million units in 1988.

From the simple beginnings of custom software drivers and basic hardware configurations, the low-speed desktop page printer industry has gone through a "big bang" expansion, creating galaxies of configurations and price levels centered around page description language preferences, CPU environments and application compatibilities. The result is over 200 companies offering different printer configurations, memory or controller boards, paper-handling and printer-sharing devices, and applications and font software development.

Hewlett-Packard, in conjunction with Canon Inc., has taken the initial lead in the less-than-10-pages-per-minute segment of the market, with Apple Computer Inc. coming in at number 2 (again with a Canon printer engine). All other printer manufacturers and resellers have had to target either a share of the leaders' established segments or a separate segment differentiated by price or function.

The top rigid disk drive vendors found 1988 a tough year to maintain growth in sales and profits. Big capital infusions in 1987 set the industry off on a binge of factory expansions in order to meet an anticipated demand of 17 million disk drives in 1988. But, instead of the anticipated 70% sales growth, consumers bought at a rate in excess of only 40% over 1987 rates.

Seagate Technology was the first to fess up to the situation in its second calendar quarter report. Micropolis Corp. was the next to report losses and full inventories. Miniscribe Corp.'s problems were first noticed at the end of December 1988 and may turn out to be severe.

Public companies reporting continued growth despite this trouble were Control Data Corp.'s Imprimis, Conner Peripherals, Maxtor and Quantum Corp. Maxtor and Imprimis are well entrenched in the high-capacity, high-performance, high-profit OEM business. Conner and Quantum both court the high end of the laptop market, as well as the graphics-oriented desktop business.

Dataquest looks for continued growth in the 3½-inch hard disk market and a move toward high-capacity, high-performance drives in the 5¼-inch arena. The 8-inch drives are encroaching on the 14-inch installed base, and watch for arrays of small diameter products to supplant their larger predecessors. ▭

Greg Blatnik, Jim Upham and Phil Devin follow the peripherals market for Dataquest Inc. of San Jose, Calif.

The Top 15 in Peripherals

Hot-selling laser printers propelled Hewlett-Packard, Canon and Apple, but the figures don't show what a difficult year it was at Seagate.

	DTM 100 RANK	COMPANY	PERIPHERALS REVENUES 1988 ($MIL.)	1987 ($MIL.)	% CHANGE*	MARKET SHARE†
1	1	IBM	10,700.0	9,661.0 **	10.75	17.6
2	6	Hitachi	3,917.6	3,036.2	29.03	6.5
3	2	Digital Equipment	3,166.2	2,764.7	14.52	5.2
4	4	NEC	2,828.4	2,270.1	24.59	4.7
5	3	Fujitsu	2,728.5	2,164.0	26.09	4.5
6	7	Hewlett-Packard	2,250.0	1,735.0	29.68	3.7
7	10	NCR	1,872.0	1,808.4	3.52	3.1
8	20	Xerox	1,725.0	1,560.0	10.58	2.8
9	14	Matsushita	1,582.9	1,185.1	33.57	2.6
10	8	Siemens	1,566.1	1,502.3	4.25	2.6
11	15	Canon	1,382.1	878.0	57.41	2.3
12	40	Seagate Technology	1,351.0	1,075.7	25.59	2.2
13	12	Apple	1,350.0	900.0	50.00	2.2
14	23	Memorex Telex	1,339.1	681.6	96.46	2.2
15	11	Groupe Bull	1,325.0	1,241.2 **	6.75	2.2

*In local currency, Hitachi's peripherals revenues were up 14.3% to ¥502 billion, NEC's were up 14.3% to ¥362.5 billion, Fujitsu's were up 11.7% to ¥349.7 billion, Matsushita's were up 18.3% to ¥202.8 billion, Siemens' were up 1.8% to DM2.7 billion, Canon's were up 39.5% to ¥177.1 billion, Memorex Telex's were up 91.7% to G2.6 billion, Groupe Bull's were up 5.8% to FF7.9 billion, Nixdorf's were flat at DM2.2 billion

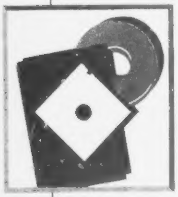
**Restated figures for 1987

†Percentage share of DTM 100 peripherals revenues

☐ PROPRIETARY OSs LOSE CLOUT, ORACLE AND RELATIONAL GAIN

BY MICHAEL BRAUDE

Among the major software trends prefigured by 1988 results will be the growth of relational data base management systems (DBMS) based on Structured Query Language. The dominance of this trend is the result of two deeper forces: irresistible pulls toward standards and also toward open architectures. SQL promises users independence from any particular DBMS or vendor and offers compatibility with IBM's strategic directions. Oracle Corp., Relational Technology Inc. (RTI) and Sybase Inc. are the main beneficiaries of this trend; IBM, Stratus Computer Inc. and Tandem Computers Inc. will benefit to a lesser extent. However, Cullinet Software Inc., Software AG of North America Inc. and Computer Corp. of America Inc. will be on the wrong side of this trend for some time.



Gartner Group projects that proprietary operating systems environments (excluding Digital and IBM) will diminish in market revenue share from 40% in 1987 to 28% in 1992. That 28% will amount to $47 billion, still a respectable target. Long before 1992, the vendors of small systems will adopt UNIX as the prime means of attracting customers.

Increasing prominence is being given to mission critical applications supporting the generation of both revenue and competitive advantage. These mission critical applications are intolerant of power outages, require subsecond response times, must be easy to use and changed quickly and need to operate across disparate platforms. Few existing applications meet these criteria.

Corporate users want to establish distributed-processing networks that can leverage their huge host-based investments in workstation technology and can also combine those machines with minicomputers. Such networks offer the promise of partially enabling mission critical applications. They also may provide a computing architecture that can adapt to streamlined corporate structures. The software vendors that maintain strong financial momentum all exploit this downsizing trend and support some measure of cooperative processing.

A successful player must also have a well-tuned distribution strategy and must find new products to pump through its distribution channel. It must leverage its installed base for revenues and for guiding new product directions.

Computer Associates International Inc. is hot largely because it best exploits these dynamics. While Computer Associates is a vendor of mainframe system software products, it now also dominates the market for PC-based small-business accounting software, as well. Gartner Group expects Computer Associates' growth to continue—reaching $1.35 billion in the 1989 calendar year.

Of all the players, Oracle best exploits standards, open architectures and the downsizing trend. Among the independents, it is second only to Computer Associates in marketing clout. Oracle's customers are receptive to its higher level initiatives, such as CASE, office systems and applications.

Relational Technology, if not exactly hot, is at least warm, pulling out of Oracle's shadow via two clever initiatives: focusing on tool interoperability (through deals with Digital and Tandem) and embedding its Ingres DBMS deeply into key firmware and operating systems.

Sybase was the first relational vendor to offer OLTP capability, an area in which it still leads. Under pressure from Oracle and Relational Technology, Sybase unveiled a new tools strategy in late 1987 and continued its differentiation via a well-presented security capability.

Major mainframe applications software vendors—Hogan Systems Inc., Management Science America Inc. and McCormack & Dodge—were all once highly profitable. But mainframe growth slowed (from 45% MIPS growth per year to an estimated 35% in 1988). A second problem is that the application software vendors must maintain large direct sales forces that have substantial knowledge of the markets into which they sell. This precludes a strategy of gradually adding products (except extensions) without increasing sales and support staff.

Microsoftware vendors (Ashton-Tate, Lotus Development Corp. and even Microsoft Corp.) do not yet understand how quickly they must grow in software sophistication. If these vendors could fathom the system management and productivity problems in large shops, they might use their large cash hoards to leverage desktop ownership into upstream prominence. Unless that transition is made, these firms may suffer. ▭

Michael Braude follows software for Gartner Group.

The Top 15 in Software

The big news in 1988 was the astounding growth of Oracle and the slowdown at Lotus.

	DTM 100 RANK	COMPANY	SOFTWARE REVENUES 1988 ($MIL.)	1987 ($MIL.)	% CHANGE*	MARKET SHARE†
1	1	IBM	7,927.0	6,836.0	15.96	38.5
2	4	NEC	890.4	676.0	31.72	4.3
3	5	Unisys	875.0	875.0 **	0.00	4.2
4	2	Digital	794.6	691.1	14.98	3.9
5	55	Computer Associates	705.4	497.6	41.76	3.4
6	3	Fujitsu	676.1	515.9	31.05	3.3
7	8	Siemens	626.4	550.8	13.73	3.0
8	66	Microsoft	610.8	397.3	53.74	3.0
9	6	Hitachi	602.1	448.8	34.16	2.9
10	11	Groupe Bull	583.0	546.1 **	6.76	2.8
11	7	Hewlett-Packard	500.0	415.0	20.48	2.4
12	82	Lotus	438.5	380.6 **	15.21	2.1
13	90	Oracle	424.6	198.0	114.44	2.1
14	18	Nixdorf	418.6	405.8	3.15	2.0
15	9	Olivetti	414.4	347.9	19.11	2.0

*In local currency, NEC's software revenues were up 16.7% to ¥114.1 billion, Fujitsu's were up 16.1% to ¥86.6 billion, Siemens' were up 11.1% to DM1.1billion, Hitachi's were up 18.9% to ¥77.2 billion, Nixdorf's were up 0.8% to DM735 million, Olivetti's were up 19.5% to L539.4 billion

**Restated figures for 1987

†Percentage share of software revenues

☐ VENDORS RIDE THE SYSTEMS INTEGRATION BOOM TO NEW HEIGHTS

BY ROBERT L. GOODWIN

Information services include professional services, systems integration, processing services and network services. Each of these markets exhibited considerably stronger performances than most equipment sectors.

Systems integration has become an important distribution channel for delivery of complex, multivendor systems. The segment is expected to increase at a compound average annual growth rate (CAGR) of 25% over the next five years in the United States, according to the Mountain View, Calif.-based market research firm Input. This market will grow from $5 billion in 1988 to $15 billion in 1993. The commercial sector will grow 31% while federal spending increases at a "mere" 18%.

Users' acceptance of systems integration is fueled by the growing perception that a well-established and reputable prime contractor may often be the best choice to manage the difficult process of creating, installing and sometimes operating very complicated systems.

Systems integration is a market dominated by large firms with deep pockets. Andersen Consulting, Computer Sciences Corp., Electronic Data Systems Corp., IBM and Unisys Corp. have leading market shares; and Digital announced its entry last fall, punctuated by its selection by Boeing Co. to provide a major manufacturing system.

Professional services include consulting, software development, education and training, and systems operations (facilities management) of client-owned systems. These services generated $15 billion in the U.S. during 1988 and will grow at a 16% CAGR, up to $32 billion in 1993. Nearly 60% of these expenditures are for software development.

The leading vendors in this market, not coincidentally, include the more prominent systems integrators, since professional services skills are a vital part of any systems integration activity. Andersen Consulting, Computer Sciences, EDS, IBM, Planning Research Corp., and TRW Inc. are among the largest vendors. This is a fragmented industry, unlike systems integration. The 10 leading vendors have a combined market share of 30%, leaving opportunities for smaller players with specific technical skills.

In both systems integration and professional services markets, project management skills are crucial. Firms with a staff of skilled project managers are leveraging this resource in their sales activities. Similarly, use of development methodologies and computer-assisted software engineering (CASE) tools provide competitive advantage to their suppliers. CASE tools are still used infrequently by information services departments, despite all the publicity surrounding the technology. Professional services firms are being more aggressive in deploying these techniques, and the strategy is working.

Processing services markets are growing more slowly than the other services sectors, but still remain healthy. From a large $19 billion base in 1988, processing services expenditures will grow at a 12% CAGR, reaching $33 billion in 1993.

Major players entered this market years ago, staked out a market niche and have held it against the inroads of mini- and microcomputers, through superior customer service, continuing product improvements and rapid delivery.

Market leaders that have chosen to specialize include Automatic Data Processing Inc. (in payroll), EDS (in medical claims processing) and Shared Medical Systems (in hospitals). By contrast, McDonnell Douglas Information Systems and Control Data Corp. have introduced a wide range of processing services and have also achieved significant revenues. Many professional services vendors have aggressively moved into other delivery modes, such as turnkey systems, software products and professional services, as a hedge against the slower growth rate in processing services.

Network services (on-line data bases, value-added networks, electronic data interchange (EDI), electronic mail) will grow at a strong 23% CAGR, from $6 billion to $17 billion during the next five years. Data base vendors represent nearly 80% of these expenditures, primarily in the credit, stock quotation, financial, news, medical and legal categories. A handful of large firms, including Dow Jones & Co., Equifax Inc., Mead Data Systems, Quotron Systems Inc. (a CitiCorp subsidiary), Reuters Holdings PLC, Telerate Systems Inc. and TRW have captured nearly 50% of the data base market. ▭

Robert L. Goodwin is vice president of Input in Mountain View, Calif.

The Top 15 in Services

EDS passed ADP and TRW to take the top spot in 1988.

	DTM 100 RANK	COMPANY	SERVICES REVENUES 1988 ($MIL.)	SERVICES REVENUES 1987 ($MIL.)	% CHANGE*	MARKET SHARE†
1	27	Electronic Data Systems	1,907.6	1,440.5	32.43	9.7
2	26	TRW	1,805.0	1,780.0	1.40	9.1
3	33	Automatic Data Processing	1,617.0	1,467.0	10.22	8.2
4	45	Computer Sciences	1,253.4	1,133.8	10.55	6.3
5	49	Arthur Andersen	1,158.5	705.9	64.12	5.9
6	16	Control Data	1,114.2	896.4	24.30	5.6
7	53	Cap Gemini	976.5	682.3	43.12	4.9
8	1	IBM	935.0	850.0	10.00	4.7
9	31	NTT	847.0	565.6	49.75	4.3
10	5	Unisys	825.0	800.0	3.13	4.2
11	43	McDonnell Douglas	791.0	825.4	(4.17)	4.0
12	65	Martin Marietta	743.4	685.7	8.41	3.8
13	80	Emhart	508.9	404.8	25.72	2.6
14	68	General Electric	495.0	450.0	10.00	2.5
15	86	American Express	446.9	383.0	16.68	2.3

*In local currency, Cap Gemini's services revenues were up 41.9% to Fr5.8 billion and NTT's were up 32.7% to ¥108.5 billion.

†Percentage share of DTM 100 services revenues.

☐ STANDARDS EMERGE, VENDORS MERGE AND CUSTOMERS RULE

BY KIM MYHRE

While many things have happened in the data communications business in 1988, very little has actually changed. The industry continued to debate emerging technical standards; there were ongoing joint ventures, mergers and acquisitions among vendors; and customers continued to struggle for control over their present and future technology investments.

These themes reflect the natural maturation of the networking business.

Market maturity is both bad and good for the network business. Bad: many of the smaller technology innovators are devoured as competition intensifies in a natural market selection process where only the strong survive. Good: with market maturity come opportunities to buy standardized, lower priced, tested and proven products from credible vendors who survived the shakeout.

If you are to believe network vendors, customers now call the shots with regard to vendor strategy and product development. These customers are now sitting on massive investments in numerous incompatible and proprietary systems, each of which remains isolated due to proprietary networking approaches. All this, at a time when networking has become critical to every organization's ability to make it in an increasingly competitive global marketplace.

What's a customer to do? Close the cash box, demand standards and watch vendors scramble to provide solutions.

Vendors have gotten the message about standards loud and clear. Never before in the information industry has there been so much discussion and controversy over standards. One IS manager recently said that one of the most frustrating aspects of his job is that most of the products on which his company's networking strategy are based are not yet available. During the past year vendors dangled a number of "emerging" technologies and "developing" standards before IS managers: OSI, SAA, FDDI, ISDN, OS/2 and the like are predicted to be keys to the future of networking.

Networking has become the new frontier of opportunity for a growing and diverse group of vendors. Facing slackening demand in their traditional market, computer manufacturers are counting on networking to help them thrive into the 1990s. When computer vendors weren't announcing networking strategies, proposing new networking standards or establishing joint ventures with networking companies, they were buying networking companies.

During the past year, IBM continued to fill in the missing links in its approach to networking. It introduced a number of OSI-based products; a 16 megabit version of its popular Token Ring LAN; LAN Server—its own slightly modified version of the OS/2 LAN Manager developed by Microsoft Corp. and 3Com Corp.

Digital Equipment Corp. stepped up its already highly regarded efforts in the networking arena with a joint venture with Northern Telecom Ltd. to develop integrated voice/data applications. Digital also announced a network management solution called Enterprise Management Architecture (EMA), which approximates OSI standards, and its own flavor of IBM's Systems Application Architecture (SAA), called Application Integration Architecture (AIA).

Data General Corp. jumped into the networking fray by announcing its own OSI-based networking strategy and joined some 14 other vendors including Unisys Corp., Prime Computer Inc. and NCR Corp. to act as an original equipment manufacturer (OEM) for the Portable Netware LAN operating systems software from Novell Inc. While Novell was picking up Netware supporters and looking to acquire TCP/IP LAN vendor Excelan Inc., other independent LAN suppliers were building their OEM relationships.

3Com and Hewlett-Packard Co. teamed up to support and promote 3+Open LAN Manager and LAN Manager/UNIX (LM/X), developed by HP and Microsoft. The two companies will support a common set of TCP/IP protocols and jointly offer customer services. To cement the commitment, HP will initially take a 5% equity investment in 3Com.

A number of data com companies have experienced a shift in demand in traditional markets that has forced them to seek partners or revamp product lines. Both Codex Corp. and Racal-Milgo have announced layoffs while maintaining strength in markets for T1 multiplexers and high-speed modems. Paradyne Corp. was acquired by AT&T. Speculation has it that competition from Paradyne interfered with AT&T's plans. ▭

Kim Myhre is with Cahners Business Research Group.

The Top 15 in Data Com

Fax sales boosted the fortunes of Canon, Matsushita and Ricoh.

	DTM 100 RANK	COMPANY	DATA COM REVENUES 1988 ($MIL.)	DATA COM REVENUES 1987 ($MIL.)	% CHANGE*	MARKET SHARE†
1	1	IBM	1,600.0	1,507.0	6.17	10.1
2	8	Siemens	1,338.3	1,402.1	(4.55)	8.4
3	21	AT&T	1,250.0	1,010.0	23.76	7.9
4	15	Canon	1,132.3	742.9	52.42	7.1
5	4	NEC	963.8	842.1	14.45	6.1
6	14	Matsushita	929.1	680.2	36.59	5.9
7	56	Northern Telecom	900.0	865.0	4.05	5.7
8	30	Ricoh	850.3	590.9	43.90	5.4
9	3	Fujitsu	816.7	674.4	21.10	5.2
10	13	Toshiba	762.4	615.4	23.89	4.8
11	31	Alcatel	721.9	1,039.3 **	(30.54)	4.6
12	61	Motorola	565.0	528.0	7.01	3.6
13	77	Racal Electronics	491.8	488.7	0.63	3.1
14	19	NV Philips	460.3	518.3	(11.19)	2.9
15	7	Hewlett-Packard	400.0	330.0	21.21	2.5

*In local currency, Siemens' data com revenues were down 6.8% to DM2.3 billion, Canon's were up 35.1% to ¥145.1 billion, NEC's were up 1.4% to ¥123.5 billion, Matsushita's were up 21% to ¥119.1 billion, Ricoh's were up 27.5% to ¥109 billion, Fujitsu's were up 7.3% to ¥104.7 billion, Toshiba's were up 9.8% to ¥97.7 billion, Alcatel's were up 32.2% to ECU610 million, Racal's were down 7.5% to £276.4 million, Philips' were down 13.3% to G910 million

**Restated figures for 1987

†Percentage share of DTM 100 data com revenues